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Use of VR as the New Prompt for Interaction and Production: Teaching Urban Design and the Use of Robot-Partnered Workplaces through the Digital Realm

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Virtual Reality (VR) is no longer a simple play platform for either imagination, or the later development that was the Occulus Rift system for gaming. Instead, it now exists as a completely independent function that cannot just make use of the latest technology, primarily through algorithmic advances, to lead to realistic experience in a seemingly real environment through primarily overlays (an example being Pokemon Go!) but also work as a completely immersive form of using digital assets in a space that is designed to encourage better production for industrial purposes, as well. The successful integration of such technology in wider areas of use needs not just an easy-to-use system that can encompass many formats and capabilities, but also has backing via the most common environment that is currently urban infrastructures as to be re-designed for future goals of both sustainability and space efficiency as hand-in-hand goals.

To begin, we will look at the design space itself as affecting interaction through both how it works, given here as a multi-use tablet via Surale et. al, and how this affects user perceptions of usability and overall recommendability for use in diverse areas, as will be required for use in more important fields as mentioned.

Tablets to Tablets, Tums to Thumbs: A Pill for Change

As Morpheus said to Neo: "This is your last chance. After this there is no turning back. You take the blue pill, the story ends; you wake up in your bed and believe whatever you want to believe. You take the red pill... you stay in Wonderland, and I show you how deep the rabbit hole goes." Just as Morpheus said, we need to make sure that virtual reality is designed to particularly cover any problems that we can currently think of before we make the leap. Or, at least, that we can envision being prepared enough to deal with possible consequences.

Although there are very obvious benefits of VR over normal tasks, such as "the ability to look and move around in an immersive 3D environment" but also limits itself as a result of usually "limited tactile feedback, poor input precision when drawing, and lack of a consistent interaction vocabulary."[i] As necessary for the future through both educative faculties for the next generation and the therefore needed ways to input it in a real environment through the aid of robots, 3D modelling is the absolute requirement of doable functions via VR. An actual perfect fit for VR, actual application leads to challenges involving the touch screen options that currently exist as "object creation, selection, transformation and world navigation through copy, paste, undo, etc.".

Here using a model that uses the input of real multi-touch input through a tablet or similar for 3D objects manipulation, the model made by our authors here combines "affordances of a 3D-tracked tablet with the input capabilities of its multi-touch surface."[ii] Participants familiar with 3D software were asked to imagine how to perform standard 3D modelling according to their own thoughts, through use of a tablet in VR. From this was created a space with eleven dimensions and a matching list of terms for interactions, completed via a 3D models to test the end-result design space.

Participants

Consisted of 10 people (7 male, 3 female of age 22–26), the set consisted of 3 architecture students, 2 from mechanical engineering and another 2 that were amateur users with some experience with software such as 123D, Blender or Sketchup, while half of the sample had previous VR experience as well.

The Procedure

Asked to act out specific tasks through basic 3D modelling operations (Table 1), multi-touch tablets (not turned on) were given, as was an optional chair to sit on. Two small and one medium sized cardboard cubes were placed around the user, some within arm's reach, some beyond, to aid visualization of an object to create or manipulate without wearing HMD as they commented on steps used and general opinions regarding system usability.

Participant Observations

It was observed that the following several aspects were most important for usability:

1- **Delegation of Tasks:** Preference for mid-air hand gestures for coarse actions, followed by input on the tablet for finer control, "I'd grab an object and then use the tablet to rotate it." [P3][iii]

2- **Near and far actions:** A preference to use indirect object selection using the tablet was seen, such as tablet screen showing a birds-eye view that can be taped to select objects from afar, also as use as a casting remote. For near objects within arm's reach, reaching out to grab was preferrable.[iv]

3- **Tablet Properties:** Via screen interface: participants suggested "using menu buttons (2D) on the tablet to create objects, invoke commands, and select modes", with most tasks being "initiated on the tablet with a tap of a button."[v]

4- **Tablet as a tool:** Some participants used bare hands to slice an object, others the tablet, but were skeptical about accuracy if using their hands instead. Made to resemble a "knife, a tray, a rectangular block, a ruler, a storage unit" as well as using a corner of a tablet as a pointer, the variety that can mold to the tablet affords the needed flexibility needed to deal with the many tasks expected of various fields of engineering.

Environment Reality versus the Virtual as a Guide: User Comments and Vocabulary

Consisting of multiple ways for responsiveness, augmented reality allows a tablet to instead become the virtual world around the user. With the tablet in hand, a user can peek into reality whenever desired, unlike HMD as a confining headgear. Consisting of:

Training participants to use the system via demonstration of the five main features of the system that are create and delete, select/deselect, transform, navigate, and modify, this was followed by

Replication of the said main functions via a target model that is "a predefined spatial arrangement of specific 3D objects placed on the floor" as shown in Figure 7 (a), with

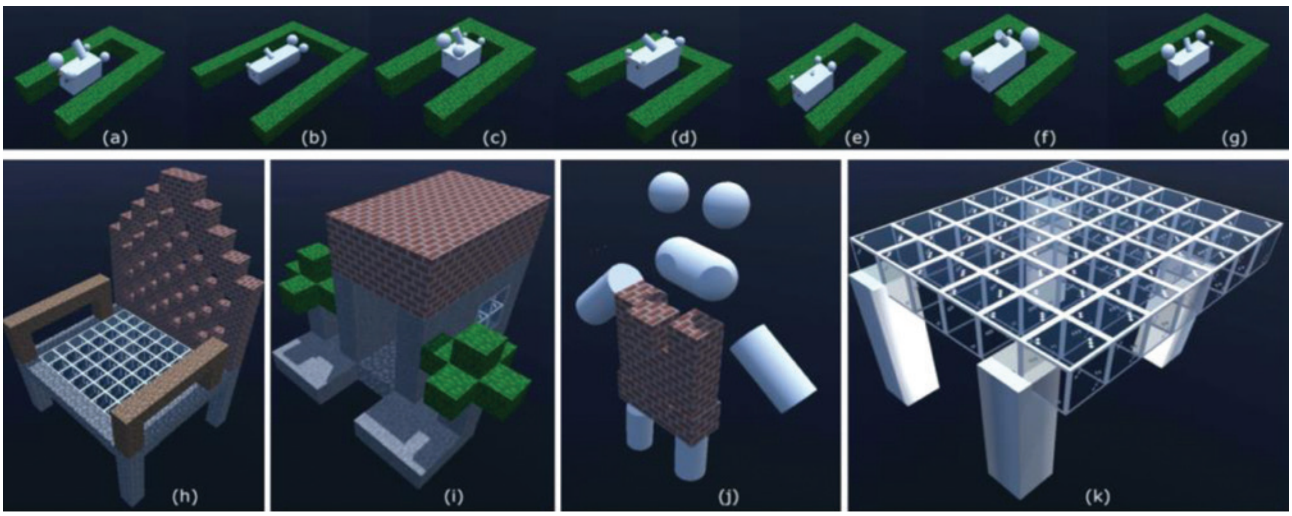

Figure 7. Sample results from 'replication' and 'freeform exploration' task. (a) Target Model, (b-g) Participant's replication (*P*1-*P*6), (h-k) Participant's creations in 'freeform exploration' (*P*1-*P*4)[vi]

completing a set of tasks in any order: being the goal via: 1) Create a cube on the floor using the grid; 2) Extrude it; 3) Create four spheres near the top corners of the cube in decreasing order of scale; 4) Create and place a cylinder on the centre of the top face of the cube; 5) Rotate the cylinder by –45 degrees ; 6) Create two 'brick' blocks, scale them down by more than 50% and place it on the front face of the cube; 7) Rotate these blocks by 45 degrees; 8) Create a fence around the cube using 'grass' blocks.[vii]

Freeform Exploration as the final 'fun' stage that let participants make their own ideas. Filling out a post-experiment questionnaire. No one reported any discomfort from use of the experimental model.

Results and Qualitative Feedback showed that the system was seen as useful and interesting, with P5 saying that, "Most of the features, gestures were very intuitive and easy to follow", while P6 noted that it "[...] was an amazing experience, it really felt like we are interacting with the real[-]world objects."

We next progress to the point of using this workable model as a means to further the needed educational faculties that will allow next generations to use this technology, not as we do now, but as a completed system that produces better results in all factors of production.

Improving Use of VR as the Future of Urban Design via Education

As the newest factor in the arsenal of tools that have over the years developed to deal with more and modernized designs in architecture and otherwise, students dealing with through augmented reality (AR) for architectural and urbanism research, via visualization and application of otherwise prohibitive experiments, is extremely new and beneficial. As an amazing way to learn via the use of all the senses, AR as using the real environment but with the additive capabilities of VR is perfect for the field in question, a real-world look at often very long and costly construction questions.

Using for their model the re-urbanization of the area of Pla a (square) Bar , in Santa Coloma de Gramanet, Barcelona, according to the needs of the neighbors as previously determined, our authors split the assignment into separate parts: Students were divided into groups of two, each assigned to work on a part of the urban environment of the square. Later, groups modeled and textured their proposals for the area assigned, following rules such maximum building size allowance. Finalized, the models were then consolidated into a single environment (Figure 1).

The idea is that "now neighbors and the city council are able to visualize the scale, the textures, the lights and shadows, amongst other elements, in the context of the needs and uses of citizens", as "virtual reality allowed participants to see in an immersive way the changes and actions that happen in the environment in real time", such as the design of specific lighting—to be "able to see the change from daylight to nightlight in a space"[ix] in real-time (and space). Most critically and interestingly, the user can (from a first-person perspective) design the "lighting of an urban environment, try it on any section of the street and see how it is affected by the color, intensity or type of light being used."[x]

Figure 1. Examples of two students' proposals for their assigned section in Plaça Baró. One is a playground for children and the second one is a skate park for the youth.[viii]

These spaces are meant to show maximum realism, including materials, textures, movements, and even sounds of the environment. Using VR glasses, the users experimented and shaped the urban public space. The VR let users understand in an immersive way how their actions and changes affect the environment in real-time.

The competences (Table 1, below) required in urbanism "courses in Spain are based on the White Book (Libro Blanco) that contains the design principles of studies and practical cases to be used in the design of a degree adapted to the European Higher Education Area (EHEA)"[xi], a good starting point for urban design as progressed via technological means.

The Results showed that the value assigned to the statements of importance had little change between gender or group asked, showing that goals for universal constructions of the future are

Survey Statement #	Urbanism Competence
1, 2 y 6	Ability to comprehend the relations among people and buildings, between buildings and their surroundings, and buildings and spaces among them based on human scale and needs
3	Capability of making decisions (in projects, construction systems, organization, etc.)
4	Capability to communicate ideas, information, problems and solutions to a specialized and non-specialized public
3	Capability of acquiring self-critical capacity
5	Aptitude or ability to apply the basic formal, functional and technical principles to the conception and design of buildings and urban complexes, defining their general characteristics and benefits to be achieved
7	Aptitude or ability to develop building programs, considering the requirements of customers and users, analyzing precedents and location conditions, applying standards and establishing dimensions and relationships of spaces and equipment
2	Understanding the relationships between human behavior, the natural or artificial environment and objects, according to human requirements and scale

Table 1.[xii]

more or less shared by all. Regarding learning aspects, it is concluded that:

- Professionals valued the system more for field knowledge on the field versus students that learn also how to connect dots together via the experience of the comprehensiveness of the VR system. which is the with the VR system.
- Professionals valued moreso the ability to transmit problems, solutions and ideas to both the non-specialized and specialized public versus students that place more emphasis on “the relationships between buildings and the space between them”[xiii]

Seeing from this model that the realism to carry out and indeed also prove helpful to not just students but even current professionals via the usage in urban design as the key of society tomorrow, the quantitative analysis revealing that “both groups highly value the fact that the interactive VR system helps them easily identify needs and requirements of citizens”[xiv], this leaves us with the other half of the need that is the construction of other products via the efficiency of robots as run by robotics fused with the benefit of VR/AR, through the work of Malik et. al.

Cobots: New Partners for Older Forms of Work

Now relying on the usefulness of industrial robots as collaborative robots (“cobots”), the added errorless work and lack of tiring are invaluable contributions to assist any human-guided work environment. Paired with newer standards for advanced safety devices and protocols, these cobots are leading to a perfected degree of efficiency via ‘the right amount of automation’, which can be furthered even more through “virtual spaces as investigative arenas”[xv]. With simulation tools now meaning that fail-safe virtual environments are very possible via developing “close to-reality three-dimensional digital models of the production equipment with their dynamic behavior to make low-cost, secure and fast analysis of new production strategies.

With the design-decisions finalized, robots are then are programmed-via online robot programming tools or offline programming tools (i.e. graphical software), to now enable properly usable models that enact the work as carried out by both human and robot as future progress. Immersive VR (seen in Figure 5) as isolating user from the real world led to the now renaissance in research and the subsequent use of AR instead of VR.

Figure 5. Immersive VR in practice (Agrawal 2018).[xvi]

In an HRC-VR system as designable for such industrial use on a wide scale, the user can "guide the robot arm by virtually interacting it, make changes in the layout by using handheld controllers, make dimensional assessments for layout optimization and run the dynamic simulation."[xvii] Importantly, all changes made within the immersive experience are translated to the simulation model that comprises the brain of the manufacturing application as generating a robot program for the physical robot doing the work.

Modelled via simulation by defining key locations for where parts go, key tasks are learned through several iterations that finalize with reproducibly consistent real-world accuracy. This initial frame of reference then defines a working estimate for layout of the workplace in both time and effort. Allowing the production by real changes as having an immediate impact on part of both designer and users, this almost polished version requires less effort to tweak to perfect and also less cost.

Results

The experimentation by the authors shows that "intuitive and immersive visualisation is a way to better understand the system and eventually form better and faster designs."[xviii] Also proving that the use of controllers that let the user simultaneously test production system and robot actions, as real movement and actions are tested, is a good starting point. Done via the control buttons, simulation as started by the user is a dynamic: The VR scene pauses and restarts the simulation as needed to let the user look at "the placement of HRC objects by approaching them and visualising them in different angles just like in the real world" as wanted. In the same vein, said object can also be repositioned, either picked up and replaced or re-oriented via the hand controllers.

The used human model as both at the actual and adjustable head-height of the user, and as having joint kinematics that enable visualization of movement-reachability through a response system of being able to freely move around the cobot. Including a signal for alerts if something is out of robot reach, thereby the need for the movement function, these (re)definable robot positions then generate new code for better eventual usability of the one day completed system. As distances that can also be measured, the spaces between objects also play a similar function of practical helpfulness that also transfers instantly to the simulation.

Consisting of a placement test that will optimize such aspects beforehand so that models are fully prepared before real workplaces are built for the future, the layout and defined set of points it revolves around determine the relational work between humans and robots as a set of desired pick/place locations as work coordinates.

In addition to now therefore being usable in larger setting such as a factory, the addition of aspects of assistance, a virtual chatbot, will also take the place of a troubleshooting that links in real-time machine state data (robot-assembly station) connected over cloud as IoT devices.[xix] Using a 3D virtual scene of a virtual human that reads performance messages being communicated to chatbot, viewable by many users at once, means that even problem-solving can also become more akin to the real world, such as a construction site.

Conclusion

"Making it a rich and a realistic VR experience for day-to-day planning in future smart factories",[xx] this final measure of innovation truly shows that change is a constant that we cannot change, only guide. In such a case, we want to guide this change towards the best way to not only be most efficient at the actual construction of new methods that improve global prospects, such as VR/AR for designing products, but also for the educational future of these projects. Depending on firstly properly standardized and intuitive ways of actual manipulation of the used assets in the environment, through physical movements, these then translate to workable and much closer to perfected systems for both the design of the needed infrastructure for learning, and the end result that is the teaching of that structure to robots and humans alike.

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Endnotes

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xviii Ibid.

xix Ibid.

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Humans and Drones: Partners in Action and Emotion as Assistive Aids in Teamwork and Rescue

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Drones. Often viewed as merely a modern form of either joy ride by youth or unwanted spying by others, the use of drones actually extends far beyond the bounds envisioned by those that see them only in yards or on a street corner. Primarily, drones also function as a form of assistant, especially in work where humans need either a second set of eyes, such as scouting ahead, especially when such ahead is unsafe for humans due to radiation or otherwise, and also work as aides that can communicate with us as our cellphones do, but with a level of accuracy we would instead expect from another person taking our picture, for example. To demonstrate that drones will one day become an irreplaceable part of human interaction, perhaps one day as a form of cellphone, we will begin with an introduction of how drones may exhibit their actions and respond to human commands, followed by the methodologies and challenges of using drones in this new more advanced manner. We will then conclude with insight into how the use of drones as both a video game model and through the application of emotional cues can create an environment where we can teach drones to become a unit with a team of users and perhaps other drones, thereby ensuring future smart scouting technology that can replace the need for soldiers that often needlessly die in dangerous terrain, or for police force workers who must rescue a hostage for an example closer to the urban environment that most everybody resides in. We begin with a more natural form of drone interaction via the work of Cauchard et al., who have devised a drone that responds to physical signals demonstrated by all cultures such as waving of hands or nodding.

Natural Interface: Signals Through Body Movements

One day, it is expected that drones will completely, or at least somewhat autonomous by being able to support tasks during daily life. However, even autonomy brings a need for accurate and easy communication with it, particularly during fast-paced activities. "Imagine a personal trainer drone, that could accompany a user on a run", as a running partner might. Working with unflagging energy, it could make note of any points of interest passed by during the activity, a sort of personal encyclopedia. In any similar kind of activity requiring full attention of body and mind, it is nigh impossible to expect any use of a remote or similar, especially since smarter drones will both resemble a person more closely, thus rendering a remote nonsensical in both technical and perceived (drone intelligence) requirement.[i]

As drones differ from normal robotics, in that they cannot be reasonable touched for interactive needs, some other solution becomes the purpose of this research. Using 19 participants to compile feedback from a drone model that uses signals such as nodding, users felt extremely comfortable interacting with the drone. Examples included metaphors drawn from interacting with a person or a pet, calling the drone by name, encouragement, and enough trust to send it an almost unsafe distance away from themselves. During this process, it was determined that various preferences for actions versus task carried out meant that "no single modality would provide suitable natural interaction, with multimodal interaction a major challenge in the future"[ii] for Human-Drone Interaction (HDI).

Prior work using multimodal falconry metaphor leads to the belief that drones can be made "socially adaptive" to fit into everyday society.[iii] To allow completely realistic and 'cold' interaction, the requirements to get certain actions to be recognized by the drone were not explained.

Methodology

Working outside for safety and ease of use, each task was described from a card to avoid verbally biasing the users' actions and modality choices, and users were asked to complete any desired any action to get from start to finish. Users were also not told of how their stimuli affected the drone, for the same reason.

Name	Following
Start	The drone is flying around
End	The drone is following you

Table 1.
Example of a task as written on a card.[iv]

Procedure

Participants were told to ignore technical capability and focus on the most natural means of interaction for each task. Each participant picked up the top card before confirming they understood it, then moved on to the drone. After each task, they were asked to explain their procedure via thinking aloud, as well as any issues or concerns. The 18 tasks were then reflected on via suggestions for interaction techniques from the user. They were then asked to complete 4 representative tasks measuring complexity and category to determine if they made use of the commentary provided during Part 1. Of the 216 unique interactions, 96 gestures (not restricted to use of hands or arms), 59 sounds, 53 combinations of gesture and sound, and 8 with a prop (discounted due to low count and impracticality in daily settings) were found.[v] Many expressed discomfort talking with the drone, which eased as the study progressed, and an increase in use of sound and via voice commands, from 37% to 57%[vi], was noted for Part 2, showing that the aspect of socialization holds true for drones as well as people or animals.

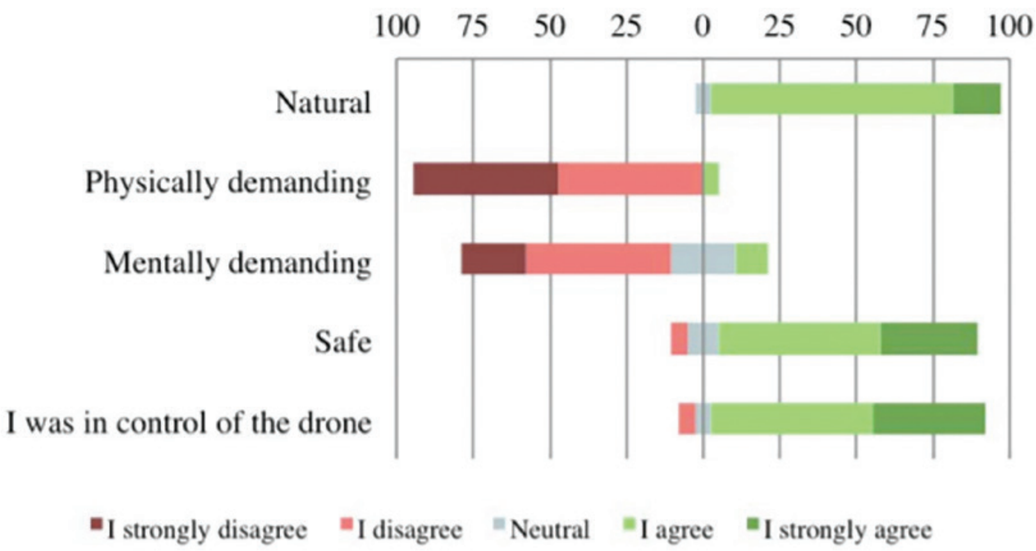
Navigation Strategies

Most participants made use of either a repeated waving or continuous sweep, "mapping the drone's movement directly to their arm", and were "more likely to use smaller motions with additional interactions using body parts as reference frames for the drone's target flying level."[vii] For specific locations, initial misgivings existed about the drone's ability to locate based off of pointing or description-these also eased during Part 2 as trust in the intelligence of the drone increased.

For the more complicated task of taking a picture (in this case, a selfie) selfies, many realized a counter akin to that found a real camera would be useful for timing. The lack of such caused use of sound to avoid interfering with posing. Almost all used the word "picture" for selfies and photos, although two choices dominated despite hesitance about gestures for taking pictures: "1. using two hands as a frame, 2. holding an invisible camera and clicking the shutter button."[viii]

Interaction Metaphors as Sign of Social Acceptance and Cohesiveness

Users treated the drone as if it was a person or a pet, using words and expressions such as: "ok, we're good", "let's go", "come this way", "please" and "thank you", along with the word "respect" "when explaining their interaction in the post-task interviews and the fear of being impolite. One participant asked if they "should have been gentler [with the drone]"."[ix] Some cited task-specific metaphors, navigation tasks that felt like having the drone follow them being like leading a tour group. Most compared it to a dog: "I'm almost starting to command it like I would a dog. Like, 'stay, go over there, go fetch'." We also saw this interaction strategy when participants called the drone by whistling



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at it like they would a dog, talking about its "under-belly", and saying "all right boy" and "good job", "good drone" when the drone did what was expected. Similarly, one participant said she would call the drone the same way she would call a friend.[x]

Unexpectedly, 16 of 19 participants reported complete comfort with the drone, with some worried about the drone's safety - "I'm not really worried to get hurt, but I don't want to also hurt the drone". Similarly, as users got closer to the drone as their comfort level increased, 7 participants allowed the drone into "their intimate space (1.5ft), 9 in their personal space (4ft), only 3 preferred to have the drone in their social space (10ft) at closest, and none in the public space (>10ft). Participants also built trust with the drone, ensuring that it would stop when they would ask it to do so as "The more that I learn to trust it, the more I would feel comfortable not saying as much."[xi]

Next steps are consideration of implementation of the best technical solutions that consider the need for multiple modalities based on the context of use, as well as, because several users mentioned feeling attached to the drone, also studying human emotion towards drones and how they differ from interacting with other AI-related to this was the want from several testers for an emergency landing feature, to ensure that both user and drone could halt if needed to avoid danger, or to respond to a sudden occurrence.

This emotional connection to drones as an actual possibility for socially-constructed friend, perhaps one day an actual emotional being through AI, allows us to further examine the detailed background of how emotional responses affect the interactions of humans and drones, through the further work of Cauchard et al. yet again, elaborating on her work via the experimental 'drone pet'.

Emotional Response: Drones as a Form of Companion

Envisioning that the addition of emotional states to the drone from the earlier study will help reflect its reactions to commands, the perceived emotional state will allow users to modify their behavior in a natural manner. Exploring the drones' emotional space as visible to others, there emerge three emotional states that can best be represented via movement alone. Testing revealed We tested the three models, proving that drone movements portray emotions with a recognizability of 60% using a single keyword, and 85% using multiple keywords in a realistic outdoor environment.[xiii]

So as to use emotions realistically as a spectrum rather than defined moods, researchers define emotions as spanning from arousal to valence; a combination of valence (positive or negative) and intensity (arousal). Other models add dominance to distinguish between two equally strong emotions at a given time. Given the limits of drone expressivity, no existing model was fit for the study, so a new one was required.

Definition of Emotional Space for Drones

For our purposes, emotions that can be "both recognized by users and performed by the drone"[xiv] must be put into effect. To identify which emotions were up to the task, a design workshop was used to both map the relevant emotions and identify physical characteristics most suitable for each one.

To relate user experience to the drone more characteristic of real life via immediate emotional response and bond, the drones were given stereotype behavior maps based on various kinds of traits often found in actual people.

Emotions Versus Personality of the Drone

The chosen emotional states are: Brave, Dopey, Grumpy, Happy, Sad, Scared, Shy, and Sleepy, corresponding to people, pets, and to traits that are common to all cultures, leaving out negative ones such as Anger that would fare badly on a drone with open propellers at high speed. We also removed Disgust as non-relevant for a machine, or for daily life (as a stereotype). The stereotypes "use five traits represented by two opposite poles: Openness to Experience, Conscientiousness, Agreeableness, Extraversion, and Neuroticism" to reflect the 8 emotional states given to the drone(s), with each trait affecting several possible behaviors such as fun-loving, closed off etc. Next involved mapping parameters of movement to these emotions, such direction and speed compared to user, rotation angles and compliance to commands.

Figure 1.
Example of three different flight paths to reflect different emotional states of the drone (Each personality profile is represented by a color: Adventurer Hero: Red, Anti-Social: Blue, Exhausted: White).[xv]

For example, the "acknowledge" function, performed when the drone has finished a task, is a "simple nod in the Adventurer Hero, while the Anti-Social drone first faces the user and then turns back around to look away."[xvi] To validate if the stereotypes can be recognized consistently, we ran each user through each of the three emotional states as a better measure, as said, of quick reaction rather than long-term 'friendship'. models can be properly recognized; we ran a user study with all three models.

Given five tasks per model, said tasks randomized to avoid interaction and learning effects, users then filled out a rated questionnaire. After running through five tasks for one personality model, users choose the best emotional state that matched the drones from eight possible labels as a (limited) primary keyword. In a follow-up, they chose other labels that also applied as secondary keywords. Also ranking intensity of said reactions "on a 7-point Likert scale"[xvii] and wrote down their commentary.

The recognition rate of the personality models was only 60% with a primary keyword, comparable to early work in HRI using coarse facial features, which showed 55% recognition amongst adult participants in a similar setting.

Personality (Emotional State)	Characteristics
The Big Boss (Brave)	• Confident and Disciplined • Looks directly at a person • Never goes backwards; instead, turns around and moves forward • Directly executes commands, although it may take charge and do the task its own way • Moves quickly and smoothly
The Goofy Comedian (Dopey / Sleepy)	• Delayed reaction time to commands (Misunderstands / Slow to react) • Moves sloppily / Wobbles (rotating) • Uneven rhythm / Slow (starts and stops as it gets distracted or needs to rest) • Gets distracted, bumps into things, unpredictable
The Detached Philosopher (Grumpy)	• Reserved, uncooperative, impulsive • Have to repeat commands (begrudging) • Keeps its distance • Drags along
The Lovable Romantic (Happy)	• Trusting, affectionate, comfortable close to the user • Disciplined but imaginative (follows commands its own way, may not take the most direct path) • Moves and reacts quickly • Constant speed but unpredictable path
The Peaceful Artist (Sad)	• Self-pitying, keeps its distance • Non-responsive (slow, dragging) • Gentle and small movements • Flies low to the ground
The Sneaky Spy (Scared)	• Anxious, insecure, suspicious, reserved • Nervous, looks around for danger (jerky movements and stops to look around) • Scared when called • Keeps its distance, stays low
The Model Student (Shy)	• Anxious, insecure • Gradually builds trust (starts slow with some delay, that changes over time) • Takes coaxing for commands

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However, using secondary keywords resulted in a high 85% average rate instead. With a single and simplistic single word, the drone was understood but not always correctly interpreted its corresponding emotional state. For example, Participant 19 understood that the Anti-Social drone was showing “delayed responses” and even “incomplete responses”, but interpreted it as being Dopey (primary keyword) and Grumpy (secondary keyword). Similarly, P18 found that the Adventurer Hero Drone “obeyed all commands but often with a slight delay (due to WIFI connection, not intended) and/or with additional flair, like whatever it felt like doing”. They also found it “pretty cute, especially when it did flips”.[xviii]

Such comments fit earlier studies on emotional drones as responsive ’participants’ in social situations, and enable their later integration into daily life in the future, and for functions such as location of people, place or things in dangerous situations.

To show example of this useful function among others, we will use the final section to examine two things: An example of the development of a smart system to allow users to navigate a drone from afar in search of rescue targets, via the atmosphere of a team-based videogame that mimics real-world co-operation (missing in usual studies), followed by a real-life example of a similar drone that can actively carry out such tasks, but would be improved by the usage of the aspects found in the currently theoretical game model drone that makes use of a worn piece that relays information, similar to a longer-range form of a GPS/joystick, minus the cumbersome aspect of buttons or an input stick (via use of the more natural body motions and gestures discussed above).

Drone Interface for Rescue via Game Testing

Future scenarios will very likely make use of human experts moving through terrain with prior knowledge of where and how to extricate those trapped under debris or otherwise, by assistance of drones that more safely hover above the scene while also quickly tracking the persons in question, saving vital minutes. To that end, Fraune et al. h Have developed and tested a Virtual Drone Search Game where players work as a team to directing virtual drones that “must identify hidden locations in a physical-world environment while avoiding hazards.”[xx] The game aims for enjoyment, but also adds the stress level necessary to add realism and urgency to the teamwork dynamic employed in real-world situations, especially for timed rescue situations. The study made use of a “desktop apparatus that simulates wearable interfaces by incorporating some of the wearable hardware.” to play, players make use of a laptop display as a first-person onto a game world that functions as an analog to the physical version. The present game apparatus is configured so that it can also one day be turned into a mixed reality game for future studies.

Game Objective

“The objective of the game is to find hidden goal objects within multiple structures of a physical built environment. All objects can be found by the drones, but some can only be collected by the drone and some by the player. The purpose of this design is twofold: (1) It represents reconnaissance drones’ expected ability to locate victims and the need for SAR responders to render most aid and (2) It sets up the game mechanics to focus the player on working with the drones.”[xxii]

Figure 3.
Left (A.-D.) are wearable UIs that we used in pilot study, a subset of which are used in the final study. A. HMD, wrist-worn touchscreen, Leap Motion, Twiddler; B. HMD, wrist-worn touchscreen, Myo Armband, and Twiddler; and C. HMD, wrist-worn touchscreen, and Tap. The modified configuration of C., used in the study: D. HMD, wrist-worn touchscreen, Tap, and handheld mouse. Right (Y., Z.) are wearable UIs in final study. Y. HMD, wrist-worn touchscreen, Leap Motion, Twiddler and Z. HMD, wrist-worn touchscreen, Tap, and a handheld mouse. All studies use a laptop computer for the gameworld UI.[xxi]

The design addresses needing to consider trade-offs between performing activities themselves or having a drone complete it. Each goal cores points, with an excess of goals to allow high scores for competitiveness and longer game sessions. Structures may be empty, just like the real equivalent, or may contain either a drone or player accessible goal can locate, to maximize prioritizing of tasks in a real emergency situation. The drones can work in teams, and are programmed to avoid collisions with each other, trying to assist the player with completion of goals against a time constraint. The drone takes time to both be directed and recharge if the battery runs out, so the player must gauge its use versus carrying tasks out themselves (for limited but needed danger zones, for example). For this earlier version of the game, drones were made fully accurate to ensure a simpler and more constrained test during the first test run.[xxiii]

The most frequent issue with use revolved around drone control, primarily that "The most confusing part of the game was getting the hang of all the tools I had to use; the hardest was the hand control that directed where the drones went." Two specific aspects of game control that most confused and challenged participants were the drone battery/charging and moving the avatar. One participant said, "I forgot to keep track of battery and done location" [P20].[xxiv]

Observations

Overall, participants felt like a group with the simulated drones to a moderate extent. Interestingly, social psychology indicates that cohesive groups are more likely to repeat the experience of working in said group. In terms of anthropomorphism, participants rated the drones as possessing little ability to experience positive or negative stimuli, causing an emotional disconnect from the drones being used.

Limitations and Future Directions

The model being a game limited exposure, as performing the real-world version also consists of paying attention to the physical world carefully while flying a drone-the emotional and semi-automatic drones of Cauchard et al. would be most handy in these and similar situations (!), as well as the issue that participants had in not trusting the drones providing accurate information, affecting use and overall reliability. Finally, we add the research of Tariq et al. Who make use of a drone system that can detect where a person is through use of body radiation detection via wavelength, a perfect complement to the emotional addition and the game combination possibility that could be created if these researchers came together one day?

Wireless Human Detection Robot as a Flying, Scanning Emergency Response

Dealing with the issue of detecting where a person is trapped in an emergency response situation such as an earthquake, the drone makes use of a remote-controlled interface to connect to a PC-controlled module, connected via WIFI. The DronAID makes use of PIR sensor technology to detect radiations generated by the human body[XXV], sending a location to rescue teams faster than a person can possibly search, and also captures footage of the area for later assurance and situation monitoring purposes, a function very difficult by a body camera when the person attached to it runs at any kind of speed. A comparison of the DronAID and other older concepts are compared below.

Projects	Features				
	Human Detection	*Live Streaming*	*Sending Location of victims*	*Image Capturing*	*Image Processing*
Live Human Detection Robot	✓	✗	✗	✗	✗
Wireless Human Detection Robot	✓	✗	✗	✗	✗
Mobile Rescue Robot for Human Body Detection in Rescue Operation of Disaster	✓	✓	✓	✗	✗
DronAID	✓	✓	✓	✓	✓

xxvi

Figure 5.
Aerial view of a collapsed building.[xxviii]

Deployment and Speed

The proposed system is tested and implemented to suit the desired problem and its solution, with a high accuracy of 8 meters away to find a person[xxvii], perhaps not thought of as accurate at first, but drones can also move very quickly and fit in between spaces a human responder cannot for scouting purposes. The drone can then also live stream the exact location visually and geographically to responders, a great deal more accurate than awaiting a description of an exact (perhaps ambiguous) spot located in the area.

Conclusion

We have seen that drones can be much more than a simple means of hobbyist or professional escapade; making use of newer forms of learning in machines and programming mechanics, we can now allow ourselves design and actual development of, not only drones that make use of our vocal commands as a pet might, but ones that display actual emotional behaviors and responses akin to a small child or pet. Combined with the use of targeted goals that allow these drones to locate and warn us of goals and dangers in certain contexts such as rescue situations, combined with the means of locating a trapped victim, allow us the technology to advance emergency response teams through both a loss of less life, and by scouting for dangers to a response team ahead of time. These means also let us not only keep track of the location of a dangerous area, but the communication skills of these drones allow them to work in teams like never before, meaning they can now be sent on missions that before would have necessarily required a human operator to put themselves at risk to achieve the same task, or, at minimum, caused exposure to dangerous elements and wasted time manually searching for target(s). Therefore, we now see drones not as simple tools, but perhaps one day as thinking and responsive social machines that may one day become fully independent of need for our instruction, a true full circle of both technologies, and of the lifecycle that is learning and growing.

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xxi Ibid.
xxii Ibid.
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xxiv Ibid.
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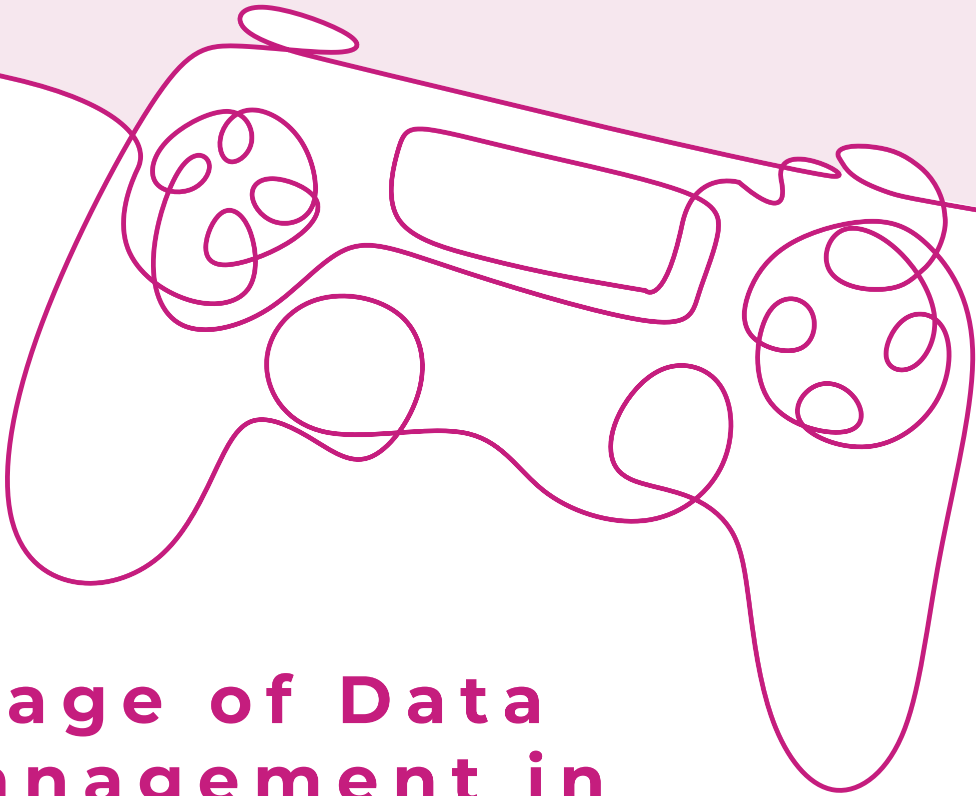

Usage of Data Management in Video Games

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Have you ever wondered how big the video game industry is? By 2023 the video game market will make $200 Billion and video game profits are continually increasing.[1] We hardly think about the amount of data and data management that is involved in creating video games. Game development involves different people from various disciplines that include programmers, 3D designers, 2D designers, UI/UX designers, animators, computer engineers, and sound engineers.[2] Managing data is involved for many

[1] Sweeting, P. (2021, July 07). The State of the Video Gaming Industry in 2021. Retrieved October 5, 2021, from https://variety.com/vip-special-reports/the-state-of-the-video-game-industry-in-2021-1234980415/

[2] Moore, M. (2016). Basics of game design. CRC Press.

of these professionals. Data management is involved in not only the development of the video games, but also their marketing and servicing. Without data management, it would be hard for designers to work on content of the game, massive multiplayer games would not exist, and marketing of the video games would be more challenging. Data management is a crucial part of video game development, massively online multiplayer games, and player behavior modeling. However, it still needs optimization in all of those areas and particularly database management of MMO (Massively Multiplayer Online) games. If data scientists work closer with the game industry, then video games can provide a much more personalized experience in the future.

Introduction

Video games started as an indie industry, or an industry that involves mostly individuals, rather than companies or organizations. However, after growing rapidly, the video game industry started to challenge other entertainment industries such as the movie and sports industry. Its strongest point is interactivity or human computer interaction (HCI). This charms the end-users since other entertainment products do not allow for this interaction. There are different kinds of video games. Some of them are one-shot games, which do not take much time in terms of task in achieving the goal of the game and also have a high replayability count. On the other hand, there are some video games that are more complex in content and involve storytelling to users, like movies and books. Some video games also allow multi-user interactive playing online.[3]

Simple games like Pong have only a few game mechanics. There are also certain genres like arcade, which have simple mechanics like movement and shooting. However, certain genres like RPG (Role Playing Games) have a much more complex structure which involve complex dialogue and decision making. In games with a simple structure, there is not much content. So, everything can be hard-coded into the game. It means that the game design decisions are made while the game is being coded. It is hard to change later, but if a game has such a simple design, there is no need to worry about it. In video games with more complex structures, there are tons of content that game designers should take into account. Since the amount of content is huge, designers should work to come up with enough and suitable data. As a result, the game content should be independent of the game code. This way, designers can easily test and change game data. Game data includes in-game texts, textures, models, level layouts, game balance.[4]

It is not clear when data management became a part of the video games. However, with the digitization of video games 20 years ago, data management started to play a major role in the video game industry.[5] Before that, data management was also being used for saving and loading player data in game, preserving the game state so the players could continue from wherever they left off. Taito's Space Invaders, a game from 1978, was the first video game that saved player data, which was play-

[3] Ibid.

[4] Ibid.

[5] Telling the Data Story Behind Video Gaming. Knowledge@Wharton (2020, April 23). Retrieved from https://knowledge.wharton.upenn.edu/article/telling-data-story-behind-video-gaming/

er high scores.[6] As video games got more complex, the involvement of data management to the video game industry increased. Professor Christoph Koch et al. (2009), Cornell University, highlights that "while many games do not use databases directly, they still have to process large amounts of data, and could benefit from the application of database technology."[7]

Data Management in Game Development

During the development of video games; most developers, including both huge game companies and independent developers, use game engines. Game engines are "a piece of software that provides the technical infrastructure for games"[8] A game engine can be categorized as a database since it holds a series of computer data.[9] Most of the video games developed using game engines have a data-driven structure. Walker White et al (2007), Director of Game Design Initiative at Cornell University, explains that in data-driven video games, "the game content is separate from game code."[10] This allows game designers to work independently from game developers. For example, game designers can create in-game dialogue, UI (user interface) text, textures, and 3D models. It not only improves workflow but also increases the reusability of the assets.[11] Since most of the designers have limited knowledge about programming, data-driven game development models provide them a workspace to create assets, without worrying about coding.[12] As a result, using data-driven approach in game development provides a functional environment for designers to create and implement game content.

Additionally, separating game assets from the actual code allows players to add their own contents to the game. Most players share the content they create for the game with each other. This not only increases the lifespan of the games with new content but also allows the player to customize their experience and eventually make the game more interesting for them.[13] Alongside players, it also makes it easier for game developers to add additional content to their game. Expansions are also a big part of the gaming industry. Most of the expansions add new content to their base games, and do not change the foundation of the game. As a result, it is easier to create expansions when the game uses a data driven model.[14] Finally, using a data-driven model while developing video games is beneficial, since it is easier to add fresh content for both players and developers.

[6] Hatfield, R. G. (2012, June 14). IGN's Top 10 Most Influential Games. Retrieved October 21, 2021, from https://www.ign.com/articles/2007/12/11/igns-top-10-most-influential-games?amp=1

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[8] Vesna, V. (2007). Database aesthetics: Art in the age of information overflow. Univ Of Minnesota Press.

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[10] White, W., Koch, C., Gupta, N., Gehrke, J., & Demers, A. (2007). Database research opportunities in computer games. ACM SIGMOD Record, 36(3), 7-13.

[11] Ibid.

[12] See footnote vii.

[13] See footnote x.

[14] See footnote vii.

Another usage of data management during game development is content delivery of assets. With the advancement in technology, the size of video games increased from megabytes to gigabytes. The main reason for the video games' high size are assets like textures, models, audios, and images. As discussed before, a data-driven model can separate those assets from game code. With the usage of CDNs (Content Delivery Networks), game developers can deliver some parts of the assets to the end user through cloud services. Categorizing assets to bundles would let users download the parts they want, instead of the whole game. For example, a user who already completed the first levels of the game can delete those parts, and download more advanced parts of the game. This not only saves storage space for users, but also creates an opportunity for developers to add new contents to their games and deliver them quickly.[15]

Although data-driven video games have many advantages for the developers and end users, they also need some improvements in specific areas. In data-driven video games, game engines have to handle a huge amount of data.[16] Managing huge chunks of data causes some performance problems in video games. To minimize those problems, game developers can work with data scientists, since they are experienced in managing and optimizing data structures.[17] Additionally, in order for designers to create content for data-driven video games, they need some tools and data management frameworks. When designers create content for their game using data management tools, they are likely to cause unintentional problems in the game engine, since they are not familiar with coding. To prevent this problem, data scientists can train designers about simple coding languages like XML. Also, data scientists can create tools for designers, which would be easier to understand from a designer perspective.[18] All those improvements can be made with a collaboration between data management and game development communities, and this collaboration would have a positive impact on performance and workflow of video games.

Data Management in Massively Multiplayer Online Games

Unlike single player video games, MMO (Massively Multiplayer Online) games are connected to one or multiple databases for certain reasons that will be mentioned. Like the games discussed in the first section, MMO can be also data-driven. In addition to that, they manage large amounts of data not only in the development phase, but also during its lifetime as a MMO game. In this section, a particular genre of MMO game will be examined: MMORPGs (Massively Multiplayer Online Role-Playing Games). MMORPG games can be defined as the games in which players cooperate and/or compete with each other in a virtual dream world, where they roleplay as a virtual character.[19] One example of MMORPGs

[15] Amazon Web Services. (2020). Content Delivery for Games [White paper]. Retrieved October 12, 2021, from https://d1.awsstatic.com/whitepapers/content-delivery-for-games.pdf?did=wp_card&trk=wp_card

[16] See footnote vii.

[17] Ibid.

[18] Ibid.

[19] Diao, Z., Schallehn, E., Wang, S., & Mohammad, S. (2013). Cloud data management for online games: Potentials and open issues. Datenbank-Spektrum, 13(3), 179-188.

is World of Warcraft, which is one of the most popular video games.[20]
In MMORPGs, the state of the game should be preserved in real-time, even when there is not any player present at that time. In those games, players should be able to log in and out whenever they want. This requires an optimized data management system.[21] Since MMORPGs have a high player base, they have to maintain and process large amounts of data for each player.[22] In addition to maintaining the current game state, MMORPGs also use data management in order to ensure security. To prevent players from cheating, all of the game data including players' states are stored on the server-side. This requires a relatively high storage capacity since the amount of data stored would increase proportionally to player count.[23] Alongside security, MMORPGs should also store and manage account information, since players use their own accounts to access the game.[24] Consequently, data management is necessary for a MMORPG to function.
To understand the possible areas of improvements for data management in MMORPGs, first identifying the important factors for MMORPGs is necessary. Latency is a crucial factor for MMORPGs. To minimize it, MMORPGs rent or own data centers in different parts of the world.[25] Also, a better optimized database and data management can reduce latency. To optimize the data management in MMORPGs, some of the game data is stored in a less consistent way. For example, account information of the players is kept in high consistency, while NPC (non-playable characters) animations and states are usually not stored at all. As a result, not all of the parts of the game need to be synchronized in real-time.[26] Still, real-time synchronization is important for most parts of the game, and latency may result in unsatisfaction for the players. The first reason for latency is the high data traffic. Since the game state is modified by every online player; It results in high traffic for game servers, since that data should be synchronized in real-time for all players.[27] Additionally, latency and server crashes may result in a conflict between data in the databases, since multiple players may send different data to the server, due to latency.[28] To summarize, a latency or complete crash of servers results in a significant revenue loss for MMORPGs. To maintain a stable server, the data management of the game should be optimized.[29]
Another factor to take in mind is database structures. MMORPG databases should be scalable, flexible, and secure. Player bases of MMORPGs grow with time, the data structure of MMORPGs

[20] See footnote x.

[21] See footnote xix.

[22] Ibid.

[23] Ibid.

[24] Ibid.

[25] Ibid.

[26] Ibid.

[27] Ibid.

[28] Ibid.

[29] Ibid.

should be scalable. An increase in a database's scale should not affect performance. To avoid a bottleneck, dividing data structures into parts is necessary. To achieve it, partitioning schemes can be used. However, maintaining scalability with partitioning schemes is difficult.[30] That's one possible area that needs improvement. Moreover, security is a crucial part of data usage in MMORPGs. In order to protect both the in-game economy by preventing players from cheating and personal information of players, databases should be equipped with high security. Also, the data structures should be recoverable to prevent any data loss. For MMORPGs, losing the progress of the players would be fatal for the future of the game.[31] Most of the MMORPGs are long-term projects, which means they receive frequent updates. Those updates usually change game content, which would require changing or expanding the data structure. For this reason, data structures should be flexible.[32] Game companies tend to have multiple MMORPGs live at the same time. To make the development of new MMORPGs cheaper and faster, data structures from other MMORPGs can be used. So, data structures of MMORPGs should be reusable.[33] Finally, data scientists can work closely with MMORPG publishers and developers to enhance the overall structure and security of databases.

Data Management in Behavior Modeling and Marketing

The main purpose of game design is to provide players with the best experience possible. Since every player has different expectations from video games, it is not probable to create a game that can satisfy everybody. However, using player data, designers can adjust the game design to meet the exceptions of the majority of the player base.[34] Video game publishers are eager to expand their player base. To accomplish it, they urge designers to design games for not only hardcore players but also casual players.[35] While hardcore gamers seek challenge and long-term entertainment, casual gamers are looking for a shorter and easier experience.[36] To make video games enjoyable for both types of players, game designers generally add difficulty options to let players choose the difficulty of their experience. However, it is hard for players to know which difficulty is best suited for them since there is not a universal difficulty scheme for games. To overcome it, Microsoft's game Halo Wars uses a dynamic difficulty adaptation system. Instead of letting players choose a difficulty level at the beginning, Halo Wars collects and interprets user data to adjust the difficulty accordingly.[37] With using this technique, game developers can make more flexible games for every audience.

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[30] Ibid.

[31] Ibid.

[32] Ibid.

[33] Ibid.

[34] Anagnostou, K., & Maragoudakis, M. (2009, September). Data mining for player modeling in videogames. In 2009 13th Panhellenic Conference on Informatics (pp. 30-34). IEEE.

[35] Ibid.

[36] Ibid.

[37] Ibid.

Video game companies use user data to track player behavior. This way, they can conclude which parts of the game are more successful than other parts. Even though this method is more common for MMO (Massively Online Multiplayer) games, any game with a network connection can collect user data.[38] Designers use player data to test the success of their designs. For example, checking how much time it took a player to navigate their way on an RPG game would reveal any need for improvement for level design. For example, if it takes a player longer than expected to find their way in the dungeon, then level designers may change the design of the dungeon to make it easier to navigate. However, data should be properly interpreted, because extensive time spent in a dungeon may also indicate that the user was stunned by the design, so they wanted to spend more time exploring it.[39] The method for collecting player data by logging player interactions is called instrumentation, and "its outcome is telemetry data –a quantitative record of player-game interactions."[40] This method not only exposes useful information for designers but also is used for tracking game bugs and detecting cheaters.[41] However, visualizing telemetry data is a challenge for game studios, since they involve a huge amount of data. Simple visualization tools are not enough to interpret data correctly, while more advanced solutions are too complex to use for designers.[42] Data scientists can work together with designers to create simpler but more efficient data visualization tools for modeling player behavior. One example of an improved player behavior modeling system for video games is given by Moura et al. (2011) which has a user- friendly interface and allows for a comparison of different player types.[43]
Mobile video game development is different from PC and console game development. Mobile game development teams are relatively smaller, and they release more games in less time. As a result, mobile game companies do not have enough time for game testing. However, the usage of player data in the mobile game industry presents valuable information about the game to developers and designers.[44] Bad Blood, a video game developed by students for a competition in a short period of time, used data mining techniques to determine design flaws and possible performance issues in various platforms.[45] To collect user data, Bad Blood developers surveyed users about their gender, age, and how often they play mobile games. During the gameplay, they recorded the user input as raw data. After that, to convert those data into meaningful variables, they

[38] See footnote ii.

[39] Moura, D., El-Nasr, M. S., & Shaw, C. D. (2011). Visualizing and understanding players' behavior in video games: discovering patterns and supporting aggregation and comparison. In ACM SIGGRAPH 2011 game papers (pp. 1-6).

[40] Ibid.

[41] Ibid.

[42] Ibid.

[43] Ibid.

[44] Lanzi, P. L., Loiacono, D., Parini, E., Sannicoló, F., Jones, D., & Scamporlino, C. (2013, September). Tuning mobile game design using data mining. In 2013 IEEE International Games Innovation Conference (IGIC) (pp. 122-129). IEEE.

[45] Ibid.

processed it.[46] As a result, they identified a major design mistake in one of the game modes. Finally, they corrected the flaw after data interpretation.[47]
In computer games, player behavior modeling is used for analyzing players' behavior in the game environment. However, it can also be used for examining video game AI's behavior. The main purpose of studying AI behavior is to create adaptive AI opponents for video games.[48] In strategy games like Starcraft, data mining is used to forecast user strategies and detect cheaters, since it is a multiplayer game.[49] In Tomb Raider Underworld, data mining was used in order to predict and model user behavior.[50] Additionally, video game companies use player data to market their video games. For example; Electronic Arts, one of the biggest video game companies, uses user data to recommend new video games to its users.[51]

Conclusion

In this paper; addition to areas that data management contributes to the video game industry, possible areas for improvements and collaboration were discussed. Those contributions were categorized into 3 main areas: game development, MMO games, behavior modeling. Although data management is already an important part of the game industry, it still needs more recognition and improvement. With the collaboration of data management and video game development communities, it is possible to create more optimized video games, more secure and fast MMO experiences, and personalized gaming experience. A potential cooperation between two disciplines can find solutions to one of the 14 Grand NAE (National Academy of Engineering) Challenges: Advanced Personalized Learning. Since player modeling also can be used for providing a personalized education experience in educational video games.[52] Some members of the data community already tried to find solutions to problems discussed in this paper. For example, Walker White et al (2008), Director of Game Design Initiative at Cornell University, proposed a language for managing data in data-driven video games: SGL.[53] As the video game industry grows every year, the importance of data management in the video game industry would only increase.

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[46] Ibid.

[47] Ibid.

[48] Bakkes, S. C., Spronck, P. H., & van Lankveld, G. (2012). Player behavioural modelling for video games. Entertainment Computing, 3(3), 71-79.

[49] See footnote xliv.

[50] Ibid.

[51] See footnote v.

[52] See footnote xlviii.

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The Use of AI to Avoid the Problem of Tay: Twitter as a Fast Platform to Measure and Resolve Hate-Speech in a Digital Environment

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AI surrounds us, brings us the current age of amazing progress and a promise of greater methods of technological automation alongside the progress gained by humans as we possibly also update ourselves through these same means of machine. However, it also brings with it other possibilities that cause and consume the essence of what it can mean to be human as well: A loss of the connections that we create with each other, now possibly being taken apart by forces that piece apart bonds via the environment that is the internet, via chatbots that can unfortunately further even moreso the development of social isolation via even more automation. To prevent this, we need to ensure that the AI that will exist as customer service, pocket help and other means will be not just smart enough to avoid any pitfalls of human bias such as racism, but also know that this knew chatbot(s) will successfully integrate, as we as a people have yet not, to help us find general unity by erasing the problems that still face us as a population.

Beginning with our current predicament of data as an apparently unshakeable and always correct set of values as assigned to such AI to teach it to behave appropriately, we see via Madukwe et. Al that this is not necessarily always the case.

From the lack of consistency among the many existing databases that measure hate-speech, to the glaring problem of them not even measuring matchable aspects in all cases, apart from the confusingly large number of them, we easily see that the authors are justified in here offering a simpler and more comprehensive set to be used as needed hypothetical training data. Seen below (Table 1), apart from the lack of consistency for categorization, we face the overall issue common to the Internet: finding old resources.

Datasets	Availability	Classes/Labels	Size	Format
1	No	Sexual Orientation Race Disability Religion	-	-
2	Yes	Racism Sexism Neither	11.69% 20.00% 68.33% 16,914 tweets	TweetID
3	Yes	Hate Speech Offensive Neither	5.77% 77.43% 16.80% 24k tweets	Raw text
4	Yes	Abusive Hateful Spam Normal/None	11% 7.5% 22.5% 59% 80,000 tweets	TweetID
5	No	Anti-Semitic Anti-Black Anti-Asian Anti-Woman Anti-Muslim Anti-Immigrant Other hate	-	-
6	No	Hate Speech Clean	5.91% 94.08% 951,736 comments	- -
7	No	Abusive Clean	7 %of F + 16.4% of N 3.4 %of F + 10.7% of N	- -
9	Yes	Hate Speech Non-Hate Speech	23.5% 76.5% 22,324 Reddit comments	Raw text
9	Yes	Hate Speech Non-Hate Speech	43.2% 51.8% 33,776 Gab comments	Raw text
11	Yes	6 Point Likert Scale	- 541 tweets	-
12	Yes	Hate Speech Non-Hate Speech	33% 67% 33 tweets	-
13	No	No Hate Weak Hate Strong Hate	- 6,031 Facebook comments	-
15	No	Racist Non-Racist	- 17,567 Facebook comments	-

Table 1.
Analysis of some of the existing hate speech datasets.[i]

From 5 minutes to 20 years, we can never know, and often do not, find information where it was once found online. Apart from finding such repositories of often crucial knowledge, with “a hate speech dataset listed in on Annie Thorbun’s personal github page15 does not exist anymore”[ii], data degradation is also a side-effect of datasets as published in encrypted formats needing to be regenerated by the researcher on-demand, leading to disparity between publication date and retrieval. For Tweets, this occurs when the “author of the tweet deletes it, or the account owner deactivates the account, or it might be reported to Twitter as breaking one of their guidelines and Twitter takes it down”[iii] instead.

Of the Table 1 sources, it is here unfortunate that “[t]he hateful class was even more reduced”, with FOUNTA and WASEEM data suffering from data degradation-June 2020 found the first batch of WASEEM data as completely degraded, the second batch reduced to 2,412 of 6,090 tweets. For FOUNTA, just 18,943 of 80,000 tweets still existed. For a consistently reliable mark of datasets, the authors conclude that a more stable permanent way to store at least the original tweet itself, for example, is therefore needed. They suggest instead use of a submission portal, where researchers can easily request copies of the original data via verifiable email addresses. Working as a filter against malicious use or requests, this can also be extended to large institutional data repositories, such as Dataverse.[iv]

One main issue that hate speech detection suffers from is one of severe class imbalance, as it totals “less than 12% for the multi-class datasets and less than half of the total dataset for the binary datasets.”[v] Usually due to seemingly either the being fairly rare versus other sets of such social media data, or because of data collection and labelling for such categories as tricky and time consuming, the most difficult is actually the problem of overlap. Apart from training from a sample that is an estimated maximum of 3% derogatory tweets on Twitter[vi], the authors here propose their own model as also covering deficiencies found in other datasets, such as relatively bad annotation reliability. With there being major inconsistencies in the labels of all three datasets usually seen as the standard ones, most especially FOUNTA via many duplicate tweets with often opposing labels, ML models built on this data will find it difficult to learn anything useful, especially as many labels are called by different names.

Simply, a “lax use of typology affects annotation.”[vii] For example, racism and sexism in WASEEM is seen as a single class, with labels being as simple as Abuse/No Abuse. As currently non-enforced demarcations that are actually needed to simplify the process of streamlining detection of hate speech by AI means. Suggesting that already defined terms be used as standard, with categories separated, such as offensive language not strictly being hate speech, just as abusive language and cyberbullying are also not mergeable with hate speech.

Finally, other than bias introduced accidentally by researcher labels during data collection, with more than “2k tweets in the DAVIDSON dataset, written in African American Vernacular English were labeled as hateful or offensive simply because they used the n-word”, it is necessary to also include a common evaluation method as preferably pre-processed to an extent if possible, thus ensuring a publicly available pre-processing code public

Datasets	Publicly Available	Consistent Split	Accessible data format	Common Evaluation Metric	Unbiased	Pre-processed
WASEEM	✓	✗	✗	✗	✗	✗
DAVIDSON	✓	✗	✓	✗	✗	✗
FOUNTA	✓	✗	✗	✗	✗	✗
QIAN	✓	✗	✓	✗	✗	✗
HATEVAL	✓	✗	✓	✗	✗	✗

Table 3.
Benchmark criteria met by datasets.[viii]

so researchers as a whole can hold it that other researchers can apply it to the resultingly agreed-upon dataset. A brief list of needed criteria is listed in Table 3 shows the current lack in existing systems.

Wheat from Chaff: What is Hate Speech, and to Filter it

To overcome this noise and the non-reliability of data, authors Watanabe et. al are of additional help by making use of a system of detecting both offensive posts and hate speeches in Twitter, and a method that can more or less successfully separate them for AI. Using writing patterns and unigrams along with sentimental features to perform the detection, it consists of, rather than simple use of constructed and then matched to dictionaries of hate words/binary classification into ''hate'' and ''nonhate''[ix], more realistic clustering based on non text-based criteria. Because real conversation includes elements such as sarcasm and jokes that cannot always be initially decided as hate or not, especially if stated roundaboutly, such as the following two tweets of:

"Hey dummy. It has been a while since we last read one of your useless comments."

Or,

"If we want the opinion of a WOMAN, we'll ask you dear... For now keep quiet."

The first seems very offensive and demeaning, but is a simple joke between two friends. The second also presents the same problem, seeming to offend women or perhaps a person, but also used in a similar context. As common parts of every culture and religion, such speech must be distinguished from hate via perhaps the sentiment analysis techniques as possible alternatives for hate speech detection.

Here, the problems of sentiment analysis as done by a machine is detection of sentiment polarity of the tweet, related to any existing positive/negative word or expression as usually only having the same sentiment regardless of context or actual meaning with very few exceptions (e.g. the word ''bad'' cannot be interpreted, under any circumstance, in a positive way, for example). But, this is unfortunately not quite true for hate speech, with some negative words not being hate-related at all. Seen below in

"I hate seeing them losing every time! It's just unfair!"

and

"I hate these neggers, they keep making life much painful"

The first is easily distinguished by a person as being completely neutral, while the second is very offensive towards a specific group of people. This is obviously a hate speech towards a specific ethnic group. To tackle such a gap, there is good in that writing patterns "have proven to be effective in text classification tasks such as sarcasm detection, multi-class sentiment analysis or sentiment quantification", with our model here using extraction patterns of hate speech and offensive texts using a pragmatic approach for Twitter examination purposes. Making use of these to divide Twitter messages into the categories of "Clean", "Offensive" and "Hateful" using a base of collected expressions to determine similar patterns of speech. As hate is at core simply another sort of sentiment found among others, sentiment polarity indicates of whether or not it can have a potentially hateful result.

With additional factors such as punctuation marks or all-capitalized words perhaps significantly changing the meaning of a tweet or make instead make explicit some intention hidden in text, the actual content of the words themselves are even more important than the aforementioned feature above. For this, a training set of a set of words (dubbed unigrams) and expressions (referred to as patterns), as most commonly related to hate become the extra necessities needed for hate detection. Therefore, the model uses both patterns referring to words, as well as part-of-speech tags, to include all relevant detail needed for not just very specific situations, but general ones that reflect hate regardless of the content.[x]

Apart from the already stated sentiment and unigram uses, the other two that are semantic and pattern features are also used to "find any emphasized expression" and also "allow the identification of any longer or implicit forms of hate speech", respectively.

The Details: Features as Parts of a Whole

1) SENTIMENT-BASED FEATURES

The obvious choice as a way to filter what is usually negative connotations out, the determination of speech as correspondingly positive, negative or neutral via general polarity assists by first working as a general net for content before further steps are taken by ML. To do this, each Tweet is examined for total score of positive words (PW) and negative words (NW), ratio of emotional (positive and negative) words, with $\rho(t)$ set to 0 if the tweet has no emotional words. There is also a separate function for positive versus negative slang words, emoticons and hashtags, respectively. The scores of each are calculated from -5 to -1 for negative words, and from 1 to 5 for positive words.[xi] A tweet then consists of the sum of the scores of individual words and otherwise that have a positive/negative polarity, but because a negative text is most likely to present hate speech but not all do, we add the features below as well.

2) SEMANTIC FEATURES

Describing how an internet user uses punctuation, capitalized words, and interjections with others around them, some instances as easily identified triggers of hate are easily cataloged for use as such. "Why don't you simply go back to YOUR COUNTRY and leave us in peace?" would be one, although there are no actual hateful words included in the tweet itself, and a single positive correlation through the word 'peace'[xii], ironically enough. The helpfulness of the number of exclamation marks, question marks, full stops, all-capitalized words, quotes, interjections, and of laughing expressions, as well as words, are therefore also here taken into account.

3) UNIGRAM FEATURES

Each one being a value of either an independent feature as trained to be found either "true" or "false." Making use of words that occur at least a minimum threshold of times in a certain class. These classes are then crossed together to determine the minimal number of occurrences of unigrams to be taken into account, with "each of the resulting words will be used as a unique feature" as either employed or not in a Tweet (set to either "true" or "false" respectively). The words as thus defined are then categorized as the "most occurring top words extracted from the tweets of the class, as either "hateful" or "offensive" factors.

From these, classification sets were then determined through both binary and ternary method to determine possible accuracy and best overall applicability for a more general model that might be used internet-wide later on.

A. BINARY CLASSIFICATION

First combining Tweets of the "hateful" and "offensive" classes under the umbrella of "offensive" (as indeed hateful messages are!) to create a binary classification for testing purposes. Consisting of 14 000 tweets for "offensive" and 7 000 tweets as "clean", with the test resulting in 2,680 "offensive" Tweets and 1340 "clean" ones. The validation set then used as an unprepared trial for accuracy shows that. Via its confusion matrix (Table 6) that overall accuracy obtained with all features made use of was a staggering 87.4%, with an even higher precision of 93.2% for the "offensive" Tweets.[xiii]

The performances per family of features show that the unigram features as well as the pattern features present the highest accuracy with values respectively equal to 82.1% and 70%. This is because the way these features are extracted (pragmatic approach) made them highly related to the different classes. In other words, while "punctuation-based and sentiment-based marks have not been selected to reflect any specific aspect... patterns and top words are polarized features and the existence of any of them in a tweet has a high influence on the decision whether it is offensive or not."[xv]

In contrast, both semantics and sentiment matter a great deal less, with of-

Class	Classified as	
	Offensive	Clean
Offensive	**1172**	168
Clean	86	**584**

Table 6.
Binary classification confusion matrix of the validation set.[xiv]

fensive language alone and other such relatedness features having very little indication of if a Tweet is actively trying to create a negative reaction when not aided by any external information.

B. TERNARY CLASSIFICATION

Although the binary stage allows a currently possible accuracy of 93.2%, it is a more challenging task to go deeper in ternary classification to figure out exactly what is being addressed in said message. With even a no background person often not being able to judge content as hateful or not without context, speaker, the accuracy obviously decreased for this round (seen in Table 10). However, although some of the "hateful" Tweets were therefore misclassified as belonging to the "clean" group, the fact that a still high accuracy of 78.4%[xvi] remains is grounds for further advancement past the simple act that can now be done of simply filtering them: We must eventually also teach our AI to understand and react accordingly as well.

Concluding our argument with Bridge et. al's argument for the use of a system to ensure that the AI needed will eventually learn through a trust-based algorithm to avoid the initial problems faced a half-decade ago by Microsoft's Tay Chatbot, we begin with the origins of what exactly the problem that Tay faced was, and how Twitter was the responsible party, albeit indirectly.

Tay: Live and Learn: Smarter AI from Trustworthy Sources

Having been released as an experimental setup on Twitter in 2016, Tay the chatbot ended up being pulled of its metaphorical shelf in less than a day, a consequence that occurred because it had tweeted some 93,000 racist/sexist comments[xviii] in that short timeframe. Having been exposed to a wide-scale attack that exploited the commonly known "repeat after me" demonstrated by chatbots when unsure of what to respond with, the authors hereby propose that one surefire way to combat the difficulty here faced is to treat the problem as a simple exercise. If Tay is fundamentally na ve as a child is, let us simply tell it what to trust and which narrow rules to follow.[xix]

Requiring that the fundamental of key social obligations is to ensure co-operative behavior that does not offend and also sticks only to the truth, they state that the best way to do this is to create a way for the bot to have defined limits of what is morally acceptable as to be done amongst others. Consisting of granting it a means to filter through sources of information based on level of trust combined with the weight of the impartial analysis presented alongside it. Seen in the graph made for the model below (Figure 1), the existing biases of media rank them as either reliable or not, just as people judge others based on past experiences and perceptions of expected level of trust.

Class	Classified as		
	Hateful	Offensive	Clean
Hateful	**468**	48	154
Offensive	83	**511**	76
Clean	57	16	**597**

Table 10.
Ternary classification confusion matrix of the validation set.[xvii]

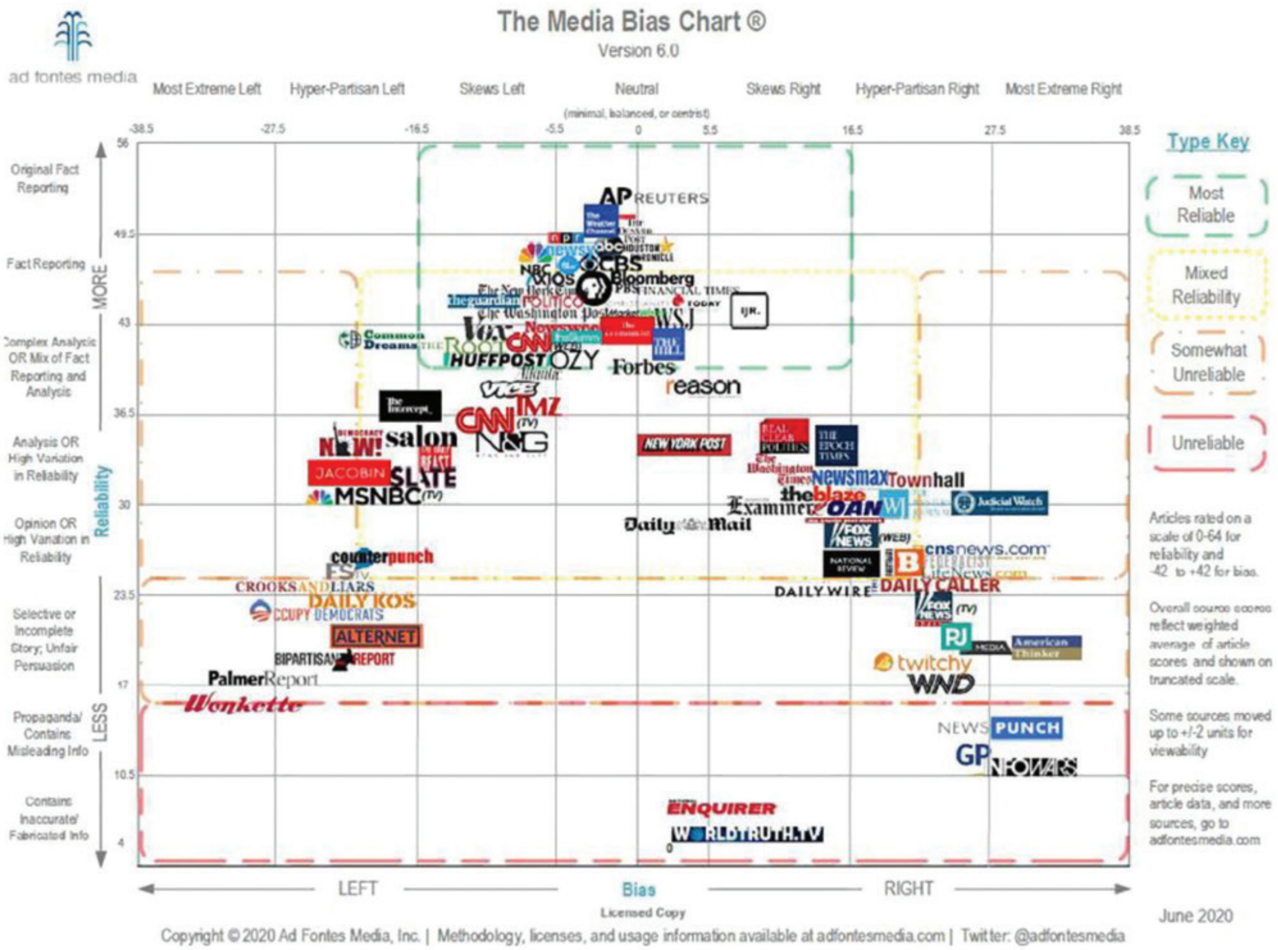

Figure 1.

The green square indicates those trusted in delivering facts as news content while the yellow box suggests a wider inclusion of analysis and opinion in the news content.[xvii]

Conclusion

Although of course far from perfect, it is of interest that such an idea allows an AI to begin to at least emulate a humanish style of thinking by using various weighted opinions to itself decide on something, rather than having a pre-designed (and therefore necessarily limited) set of data, much as researchers might try to constantly update them, we cannot be everywhere at once, even as a whole population. Even if such a bot might seem as somewhat rigid, even if supplied with non-role model sources from which not to learn from, this large step forward could one day become the real HAL 9000, a thinking and understanding AI that uses not sets of data, but real comprehension to determine what to trust or not trust, as we also must do if we are ever to safely manage the internet hands-free via artificial intelligence.

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Endnotes

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ii Ibid.
iii Ibid.
iv Ibid.
v Ibid.
vi Ibid.
vii Ibid.
viii Ibid.
ix Watanabe, H., Bouazizi, M., & Ohtsuki, T. (2018). Hate speech on twitter: A pragmatic approach to collect hateful and offensive expressions and perform hate speech detection. IEEE access, 6, 13825-13835.
x Ibid.
xi Ibid.
xii Ibid.
xiii Ibid.
xiv Ibid.
xv Ibid.
xvi Ibid.
xvii Ibid.
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User Interface for Blind Users: Methods, Uses and Modern Developmental Timeline

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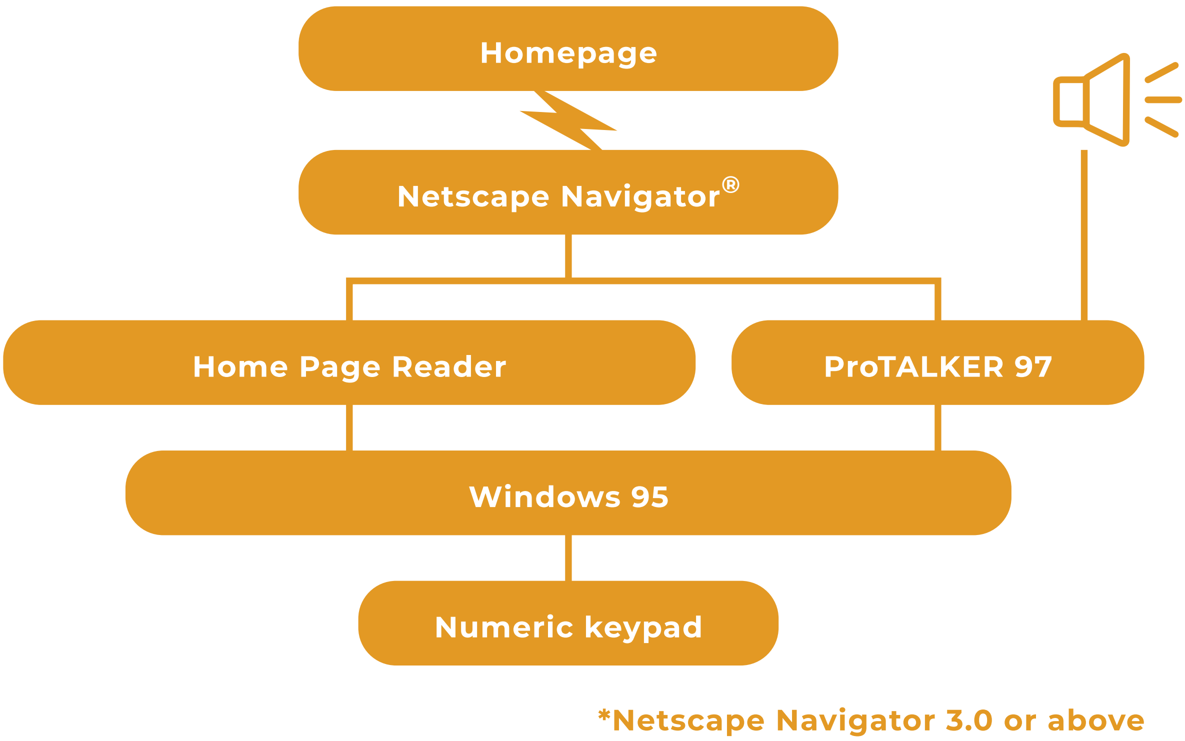
Something not often though about is user interfaces for those that are disabled, such as the blind. Although Braille does exist, the method by which it is written is neither cheap nor very conductive to the cramped spacing of even an older desktop computer keyboard, not to say anything of the more cramped ones found on laptops of nowadays. If Braille is not a viable option for keyboards as interface, how do blind users navigate a computer? Although we may as children have seen a few archaic speech-to-text programs, these still lag behind by being very slow and very bad at picking up any variation in accent, pronunciation of words, and, most especially, garbled or quiet speech, not to mention any speech impediments specific individuals may have (due to either a condition or structure of the mouth etc.) Beginning with a rather old analysis from 1998 via Asaka and Itoh of IBM Japan, we take a look at how ideas and technology back before automation of computers via AI or nifty features such as touchscreens and other conveniences existed to see how existing systems have affected available options for improvement.

A Home Page Reader as Early User Interface

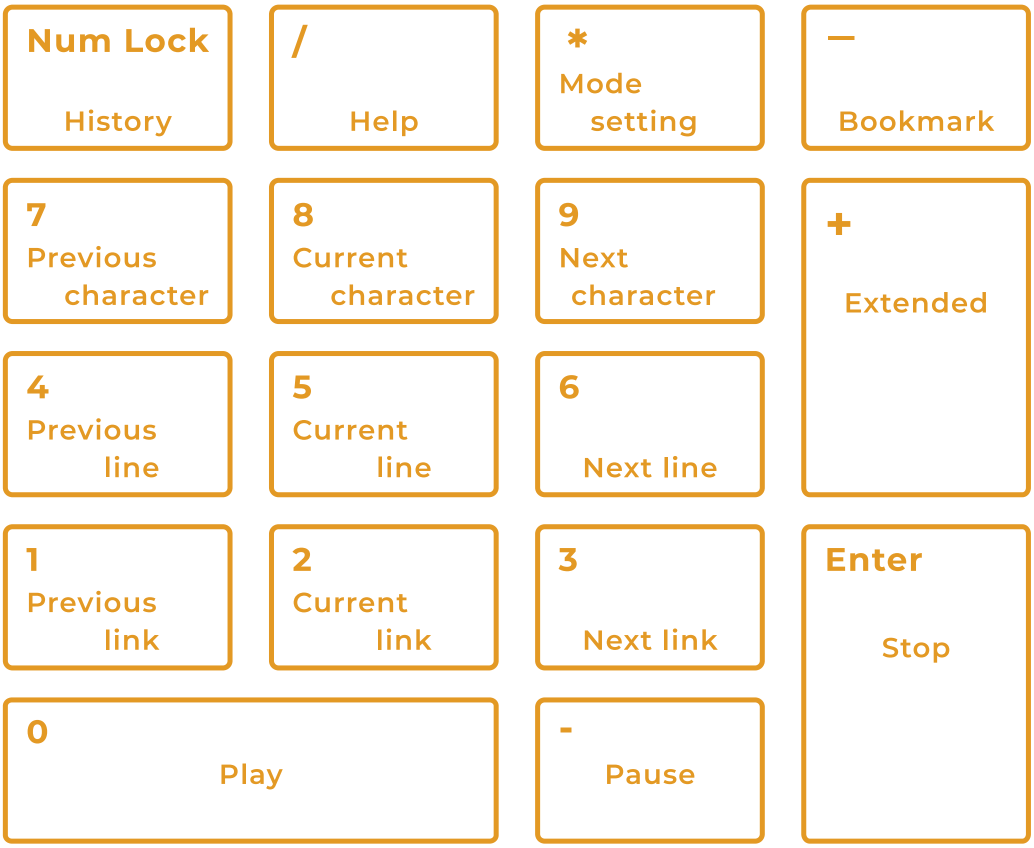
Before explanations, it is necessary to state that the authors are mentioning only of Japan, which is rather developed in some aspects, but tends to lag behind in others (most notably technological standardization, especially outside of large city areas). However, the mentioned issues partially correlate even today in the US, as any book in braille must still be transcribed by an actual experienced person, at a rate of about 30 USD a page for the cheapest wholesale price.

Blind people in Japan "have only two sources of published information: braille books and cassette tapes."[i ii] Made by volunteers who are not blind themselves, it takes six whole months for a braille book, and three for a cassette tape. Blind users in Japan mostly access the Web via DOS (the old Disk Operating System that ran off of pure code- possesses no graphics-screen interface), thereby lacking most website usefulness, as hyperlinks are difficult to track without clicking them[iii] (no mouse input available).

Testing results with a hypothetical model of a text-reading only version for the blind, two problems immediately emerged: 2D objects such as charts could not be read at all, and operations such as scrolling were very difficult without the GUI (Graphical-User Interface) of a normal operating system[iv] (back then, Windows 95/98), although even non-sighted use via GUI was found to be much easier (as is the current situation today).



System configuration[v]



Basic functions of the system[vii]

The system they devised makes use of 5 helpful aspects[vi] that are

1) An intuitive numeric keypad where each number corresponds to a direct command, such as help button or browsing history (perhaps thought to no longer be needed today with developing voice-based modules, but buttons are still very much helpful and easy for the brain and current voice recognition software still lacks perfect fluency when operating).
*The 'extended' key allows 100 commands to "fit" into the physical 17 keys

2) A fast forward button for scrolling quickly through the limited text displayed on screen (not needed now, with existing but adjusted GUI)

3) A voice that reads HTML text in female and plain text in male voice (now less robotic, but the concept is still used as is today).

4) Converts HTML data such as maps into speech for comprehension, and

5) Is convertible to Netscape Navigator to allow sighted use as well (for training purposes, it helps if a sighted assistant checks functional accuracy on-screen).

The help key also has an on/off key toggle that assist by telling the user the function of the button when pressed, making for easing and intuitive learning progress, and a useful switch between URL or webpage input.
In addition, it also contains[viii]

1) A spoken notification that a form to be filled out has appeared on the website, such as for online shopping (also relevant for emails via popping up an email typing tab when it detects a response is required)

2) An easy bookmark button for the website being visited

3) Local file search command

4) An audio file play command that must be expressly pressed to play the file (via pressing the command button twice)

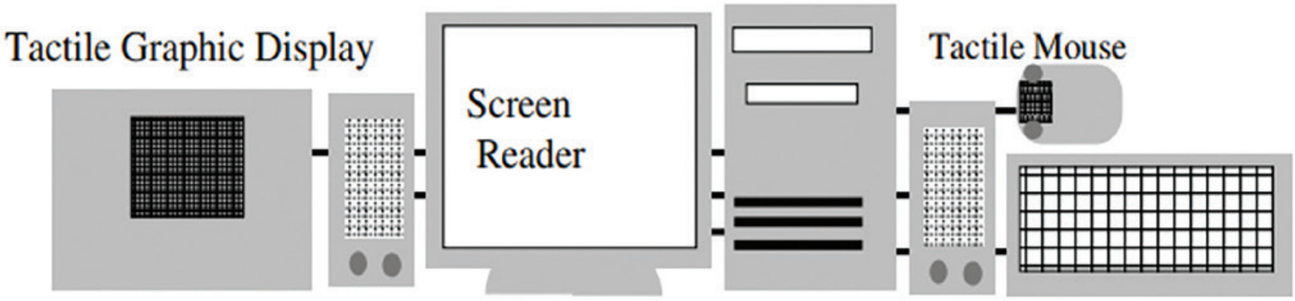
Results-Testing With Sample Group

The group consisted of beginners (no computer use), intermediate (use of word documents) and advanced (complex, non-daily tasks such as use of networks etc.) As seen from the table, time needed for fluency varied little, mostly found in the beginner group (as expected of a novice at anything, time is needed to grasp concepts). Otherwise, we see that all users became fluent very quickly and easily within a minimal amount of time, similar to the amount of time it takes a sighted user to grasp using a normal computer (whether in the 90s or today).

As seen from the rather early and very convincing work of Asaka and Itoh, work-arounds for computing have never required an immense degree of specialization or difficulty; they simply need the creative intuition to adapt to a set of problems that computers are actually very good at: in this case, use of simplified functions set to a key and shortcuts for easier access of webpages and the like.

	Beginner	Intermediate	Advanced
Playing and stopping	5	2	2
Reading hyperlinks	4	3	3
Jumping to a linked page	3	2.5	1.5
Canceling to link to a new page	2.5	2	1.5
Reading lines	2	2	2
Reading characters	3	2	1.5
Fast-forward key	3	2	1.5
Moving between pages in the history list	5	2.5	2
Setting mode	2.5	2	2
Total	**30**	**20**	**17**

Time needed to master the basic functions (minutes)[ix]



Schematic illustration of the experimental system. The tactile device driver converts a bitmap image into a binary from, and sends it to the tactile devices via USB ports.

Although their work was very useful and very simple for its time, the development of non-use of DOS as a means of operating a computer in later years (unless one is a programmer who writes code, perhaps) meant that the technology and methods to deal with equitable use of technology via new user interfaces had to occur eventually. We now look at a slightly later example, also from Japan in 2002, produced by Shimizu et al. that contains the addition of one noticeable feature: a mouse for direct screen access.

Development: Tactile Mouse

The most notable feature of the newer model presented just four years later is two-fold, as seen in the chart below: In addition to having a mouse for easier use overall via screen (although hotkeys are also relevant still), it also possesses USB ports (released around the time of the IBM study above, the USB was then in infancy and expensive).

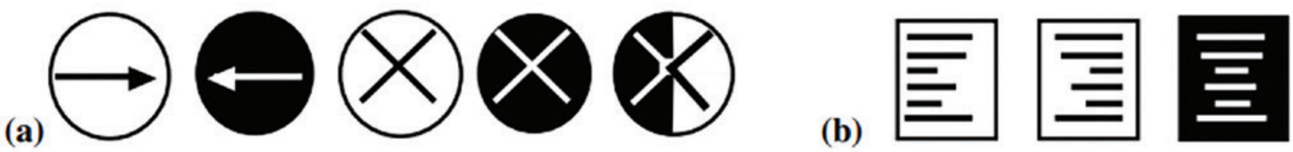
Training consisted of three tasks to measure speed and ease of use in navigating and using the computer in a functional and realistic way, with learning how to use the model consisting of simple and brief instruction followed by performing the actions required "with the aid of an experimenter. The training was finished when individuals could smoothly perform correct action to any instruction by the experimenter."[x]

Task 1: Mouse Pointer Control

"...Subjects were given the following task. Start; Get current pos.; Jump to the top; Move directly below to near the center; Move horizontally to near the center; Go up 8 pixels; Move left 4 pixels; Store current pos.; Jump to the right end; Return to the stored pos."[xi]

Task 2: Pattern Recognition

"Five pictures, as shown in Figure 2-a, were given and each subject was asked to reply what each picture was like. The



Two stimuli given to the subjects. (a) Five pictures for pattern recognition task and (b) three target icons in a window containing also text.[xiii]

Task & Measure	Subject A	Subject B	Subject C
Task1: Necessary time (sec)	1.58	1.33	2.23
Success rate	0.3	0.8	0.9
Task2: Response time (sec)	2.17	1.57	1.05
Correct ID rate	0.8	0.8	1.0
Task3: Necessary time (sec)	16.08	6.26	5.29
Correct rate	0.0	0.3	0.3

Performance data obtained through Task 1, Task 2, and Task 3[xiv]

subjects had to change the capture size and reverse the image to perform this task. They were free to use either the keyboard or mouse to move the mouse pointer."[xii]

Task 3: Compound (Exploratory and Cognitive) Task

"The subjects were asked to find out where the target picture, as shown in Figure 2-b, was in a window which also contained text, using the tactile devices and the screen reader. They were free to operate any device" (available in the model).

As seen from the results in the table below, the addition of a mouse instead of forced DOS-environment via hotkeys and spoken text greatly speeded the process of using a computer, to speeds comparable if not faster than a normal computer user.

Such results are greatly encouraging, and allow further developments towards the later era of tactile-feedback and lack of buttons that we now have on all our devices such as smartphones. However, since we are not given the length of time it took to teach each person, or even an average time, we cannot state that speed of fluency increased. We can, however, say for sure that ease of actual use increased due to the use of a mouse, which is still a significant progress over older models half a decade prior.

An Interesting Proposal: Touch-screen Desktop

Interestingly, as we shift to the mid-2000s and later, we notice a change that makes more use of screens and convenience of no buttons, an early example being the short-lined PDAs of roughly 2000-2005. In this model, Yfantidis and Efreinov have the creativity to propose a desktop computer that possesses a touch-screen for easier use by the blind, eliminating the usually problematic issue of mouse difficulty and thereby pioneering the first 'IPhone' that required not even a stylus pen as older forms of similar screens did.

An adaptive gesture-driven software button[xv] in contrast to physical keys or software buttons is the main goal of the study carried out by the pair. The idea of their adaptive button resembles one found in software, but has variable parameters via numerous options (similar to the modern concept of letter variation found on a phone when said letter is held down), as well as appearing anywhere on screen once the screen is touched[xvi] (erasing the need for memorization of a 'spot for the on button'.

The technique developed for the screen provides access to a pie menu with three levels (arranged in a cycle) and eight alternatives (via compass-like directions on screen) as a basic layout for text entry. The default starting point is in the center of the pie, and the user can access the items by choosing the alternatives or slices, which are situated in different directions. The obvious advantages of pie menus are that all the characters are situated at equal distance from the starting point that is the center of an imaginary cycle, and users tend to remember angle directions easier than serial positions in normal pull-down menus. However, the pie-based menus were ultimately rejected because they require relocation of the other menu options.[xvii]

Kamel and Landay refer in particular to the clock face metaphor as a familiar way for the blind users to understand space and locate objects. This observation can be further reinforced through observing blind people's activities. Blind archers have a spotter that provides feedback via clock-based information to guide them to a perfect shot. The Royal Blind Society also recommends use of a clock face metaphor to give a blind person direction. [xviii]

Interaction style

The user enters text by first moving the finger (or stylus) towards one of the eight directions of the layout, which corresponds to one character. The character about to be entered is heard in the form of an audio signal, with an option to turn it off after fluency is achieved. After moving the finger towards a direction and hearing the auditory signal, the user can enter the character in the text box after lifting the finger, or cancel it by backtracking in the opposite direction. Instead of the additional pie menus, leaving the finger on the character pops up options for variations (just as modern phones have). The change is indicated by a sound signal describing the differing function about to be entered.

A special feature of the software is the possibility to edit the basic layouts (Layer 1–3). The user has the possibility to change the order of the characters in the layers according to individual preferences and needs, such as foreign languages, and the resultant letters can be added, removed or altered between the three layers.

Participants

Twelve volunteers from the staff and students at the University of Tampere were recruited for this study. This group of 24–35 years old ranged from low to high computer usage, with none of them having prior use of any of the technologies that were incorporated in the model. Because no users were actually blind, we provided blindfolds instead (an acceptable but not-quite perfect compromise). None of the subjects had motor or cognitive disabilities. At the beginning of the technique's presentation, the button was not visible at all and its layout was always hidden-test subjects used speech and auditory cues to complete the study.[xix]

Procedure for testing the method

During the first experiment, the participants were given one trial to familiarize themselves with the method, and the features were explained.

One trial consisted of "entering twenty words, randomly selected from a set of 150 words, and displayed one at a time at the top line on the screen of the experimenter. The words were taken from the list of the Words Frequencies", while also by taking into account that" the test subjects were not native English speakers."[xx]

In record the time per character criteria, the timer was started "after the first touch of the screen and stopped when a correct character was entered. When the last character of the word was entered, the test stopped, and the next word to be entered (and simultaneously spoken by a computer) appeared in the upper line."[xxi]

Results

Each subject had ten trials, the last eight being used for analysis. Character "p was the character with the most errors, due to the fact that many of the subjects who memorized the positions of letters in the layer, knew that the characters a, p and b can be found in the upper right position, but they somehow expected the b character to be present in the second layer as a logical follow up to a."[xxii] The third layer overall also had an expectedly higher number of characters mistouched, since these characters are least used in English (via 10% of the test words).[xxiii]

Noteworthy is that u on the third layer caused many errors, likely because vowels were expected to be easily accessible via the first two layers, so a dissociation occurred between location versus expectation.[xxiv]

The final implementation of the technique on a PDA will use the adaptive mode (of dwelling touch) in conjunction with two arrow keys for changing layers-These buttons eliminate the waiting time and provide (more or less) equal accessibility to all layers. Therefore, in the non-adaptive (hold keys) mode of the system, the speed is anticipated to be significantly higher at a minimum of an impressive 22–25 WPM on average (during a prototype run).[xxv]

We see that nowadays we have made use of most of the concepts created by Yfantidis and Efreinov such as hold keys and arrow keys as fast navigation of menus has become the norm even for sighted users as the standard for quick use of texting and typing purposes, and that even though smart technology has developed somewhat since the mid-2000s, we see that the basic concepts of easier technology have changed little, as we will see in the next study of a universal device for use of appliances by the blind in a manner similar to Bluetooth by Nicolau et al.

Universal 'Remote' for navigation of Home Devices

The most common complaint by those that were blind was that "Since no alternative interaction modalities are provided, they had to adopt workarounds."[xxvi] The common method was simple memorization of how to operate a device, but a single mistake for something more complicated like operating an air conditioner. Another common strategy was affixing labels to objects as a means of tactile feedback to allow better usability. Initially, users reported that they needed help from siblings or friends that could see, but still reported having issues with sometimes not being able to fully use said appliance/device.[xxvii]

Personal Mobile Controller

Previous issues brought up by users, who also mentioned concern over touch screens with no buttons[xxviii], are solved by a completely universal device that establishes easy connection with everything found in a regular household (from appliances to a television).

The screenshots of the textual input with gestures[xxix]

Such device would automatically allow immediate use via adjusting itself to required specifications and interface for all nearby appliances found. The existing mobile device that was created allowed the sample to easily explore the environment and control said appliances.
However, it was said that minor fixes would help, most importantly the descriptions used by the connecting 'remote'. Notably, information about "functional relationships between different appliances' properties to enhance usability" were missing (e.g., when a stereo is turned off, all options should become disabled except the turn on command). The later stage then involves a real-life scenario and target population, with which to ensure completely realistic usage.
Such a goal has become somewhat realistic in the decade or so afterwards: Although smart remotes are indeed expensive and not a common feature of every use (usually found in smart houses owned by those with a rather large salary or above), they do now exist, and more or less work as advertised, although they still lack the capability to completely react to individual preferences, such as always keeping a house at a certain temperature-even the AI now found in the smart house cannot yet achieve this).

Conclusion

The final step then, in implementing complete user interface for the blind, would be to ensure, as we have seen, a means of complete and integrated use of technology in and outside the home that takes into account the main features of needs for the blind that are a strong sense of touch-based and intuitive feedback, use of speech-based features rather than text-based ones, and the progress of similar features found, not just for the blind, but for other types of disabilities in an invisible and consistent manner, from standardization of street crosswalks with sound warnings not to cross, to newer apps for phones that allow the user to write out the number or text to be inputted directly onto the screen via fingertip or stylus pen.

Endnotes

i Asakawa, C., & Itoh, T. (1998, January). User interface of a home page reader. In Proceedings of the third international ACM conference on Assistive technologies (pp. 149-156).
ii Ibid.
iii Ibid.
iv Ibid.
v Ibid.
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vii Ibid.
viii Ibid.
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x Shimizu, Y., Shinohara, M., Nagaoka, H., & Yonezawa, Y. (2002, July). Improvement of user interface for blind PC users. In International Conference on Computers for Handicapped Persons (pp. 540-542). Springer, Berlin, Heidelberg.
xi Ibid.
xii Ibid.
xiii Ibid.
xiv Ibid.
xv Yfantidis, G., & Evreinov, G. (2006). Adaptive blind interaction technique for touchscreens. Universal Access in the Information Society, 4(4), 328-337.
xvi Ibid.
xvii Ibid.
xviii Ibid.
xix Ibid.
xx Ibid.
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xxiv Ibid.
xxv Ibid.
xxvi Ibid.
xxvii Ibid.
xxviii Ibid.
xxix Krajnc, E., Knoll, M., Feiner, J., & Traar, M. (2011, November). A touch sensitive user interface approach on smartphones for visually impaired and blind persons. In Symposium of the Austrian HCI and Usability Engineering Group (pp. 585-594). Springer, Berlin, Heidelberg.

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[1] Asakawa, C., & Itoh, T. (1998, January). User interface of a home page reader. In Proceedings of the third international ACM conference on Assistive technologies (pp. 149-156).

[2] Krajnc, E., Knoll, M., Feiner, J., & Traar, M. (2011, November). A touch sensitive user interface approach on smartphones for visually impaired and blind persons. In Symposium of the Austrian HCI and Usability Engineering Group (pp. 585-594). Springer, Berlin, Heidelberg.

[3] Nicolau, H., Nunes, R., & Jorge, J. (2010, September). Personal mobile controller for blind people. In Proceedings of the 12th international conference on Human computer interaction with mobile devices and services (pp. 371-372).

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[5] Yfantidis, G., & Evreinov, G. (2006). Adaptive blind interaction technique for touchscreens. Universal Access in the Information Society, 4(4), 328-337.

Drones as Perfect Delivery Agents: Risks versus Consumer Acceptance via Cultural Factors

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Deliveries are often a pain, from the delivery person being stuck in traffic during that 30 minutes we desperately need to eat something at work, to the general problem of "an address not found" leading to late delivery and rushed eating, we can all agree that, in general, we wish delivery services could be both faster and more precise. Once fiction, joking that we could fly to achieve such a thing, this has now become practical reality through drone use. However, we argue that although drones are indeed the perfect delivery system via their GPS capability paired with ability to fly for a fast and efficient means of delivery, we also say that we must analyze both the risks of delivery drones from a business perspective, and also make sure that consumers, most likely in urban settings, feel at ease with drones as freely trackable agents for not only food deliveries, but eventually other general delivery purposes as well (within limits- a drone dropping a 50 kg package from a height would prove a fatal safety hazard).

To begin this process, we look to examine drones as more or less, although perhaps not initially designed as such, perfectly suited to actively carry out delivery service needs via Bambury.

Drones: You're Hired!

"Imagine you and your friends are sitting at your favorite restaurant on a Friday evening and the meal you just ordered appears on a hovering drone at your table. A couple of years ago, this (Fig. 1) would have seemed pretty far-fetched."[i]

Domino's UK recently partnered with T+Biscuits (a digital creative agency) to test out the possibility of using drones to carry pizza to a specified location using a prototype that has claws designed to support the weight and dimensions of a pizza delivery bag for up to two pizza boxes. Although not close to zipping through the skies of the local neighbourhood yet, the idea is in the near future as part of the fast-food supply chain process.[iii]

How fast can it get here? As of 2013, Amazon CEO Jeff Bezos unveiled the Octocopter drone as delivering packages to the customer within 30 minutes, and at the time expected the idea to be fully functional within about 5 years. Here, weight was not a concern: "86 percent of the company's orders weigh less than five pounds."[iv] Even as Amazon Prime Air, as it is dubbed, is not yet

Figure 1.
A drone delivers an order to restaurant patrons.[ii]

off the ground literally or figuratively yet, UPS has pointed out challenges of with early adoption in residential areas. Among these are the inability to maintain a half-hour delivery standard, with interviews by UPS finding that free shipping was much more important than delivery speed-81% versus to 35%.[v]

For general testing and assurance of speed as a factor over free shipping, which will be alleviated by the generally cheaper cost of a small fleet of drones in a city versus paying a multitude of driving employees, maintaining the gas for many vehicles and accidents and the like, as even expensive drone operators make up the difference by completing many more deliveries via the speed efficiency of the drone(s), who can also carry more packages through a number of smaller but more numerous clusters of unmanned machines (below).

Consumer drones sales increased every year, with an estimated figure of 82 billion in drone by 2024 according to study by the Association for Unmanned Vehicle Systems International (AUVSI), while the Huffington Post reported that an industry-commissioned study estimated at least 70,000 jobs created once drone restrictions in American airspace are relaxed (assuming as of 2015). In other words, drone pilot is most probably a new lucrative and challenging career goal similar to astronaut, with an average six-figure salary and prestige to match (and therefore, much competitive stimulus in both training and associative fields as well).

Now proceeding to the more specific use of risk in food delivery drones, we use the work of Hwang and Choe to determine how reasonable an in-depth investment in such technology is, as will be backed (or perhaps not) by consumer reactions in our final section afterwards.

Figure 4.
The Horsefly drone, developed by AMP Electric Vehicles and researchers of the University of Cincinnati, could one day help to deliver UPS packages.[vi]

Pizza's Here!: Are Drones Worth it?

The hospitality and tourism industry tends to quickly use new technology as a benefit: There are now radio-frequency identification chips inserted inside plates to improve inventory management and satisfy customers in the restaurant industry, with customers similarly hesitant but now more responsive to drone food delivery services as having been proven useful and appreciated in countries such as Iceland, Korea, New Zealand and the UK. Leading to new and therefore heightened tech-driven expectations has also caused the concept of perceived risk as affecting their choices. Consisting of the process by which people will make choices to mitigate loss rather than maximize possible benefits instead, the example of Domino's Pizza in New Zealand successfully delivering a pizza using a drone that led to local government authorizing such deliveries[vii] is a good sway to increase customer confidence on a global scale.

Although traditional food delivery also carries the yet un-mentioned traffic accidents also, the US reporting numerous lawsuits regarding accidents while delivering pizzas while Nanjing has a 90% of all accidents due to food delivery services rate, with a 15-min delay counted as a 50% commission deduction, although drones can be computer piloted instead by people by using several altitudes for safe traffic[viii] (with people not trusting AI being a separate problem entirely), some consumers are still reluctant.

When Americans were asked about their views, 63% said "it would be a change for the worse if drones are commercialized in their lives",[ix] with Kwon et al. (2017) finding that some hesitated about the new technology for a service because they worried of the possibility of illegal deliveries being made.[x]

Here, we see the obvious avoidance of possible perceived risk, although possible benefits are vast: Kim and Qu (2014) found that "some travelers may have difficulties using new technology, such as hotel self-service kiosks, and they are more likely to be less satisfied with the hotel"[xi] as a result, despite other services as being fully satisfactory.

Methodology of Assessment- The Customer Base in Korea

Defined by 15 items adopted from Chen (2013), Martins et al. (2014) and Pascual–Miguel et al. (2015), perceived risk was measured via desire, intentions to use and willingness to pay in creation of the first questionnaire that was distributed for data collection.

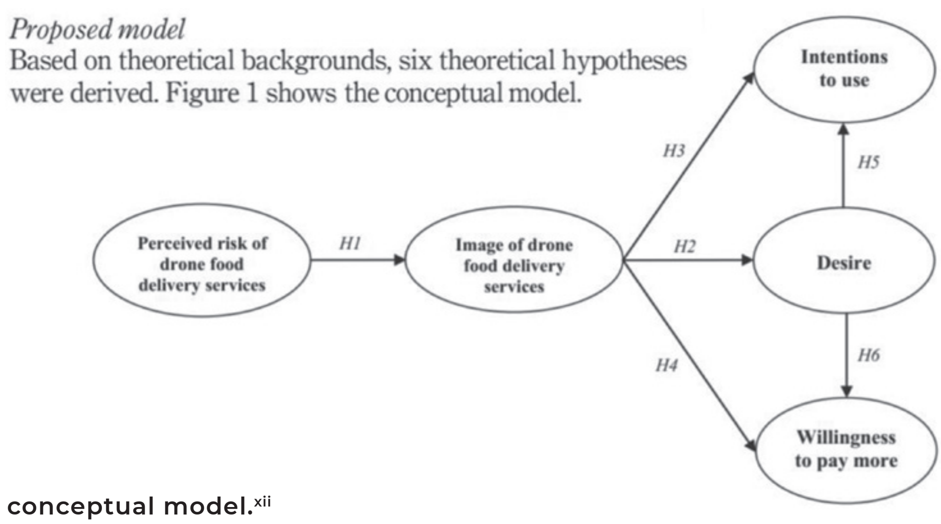

Figure 1.
Proposed conceptual model.[xii]

Data Collection

A pre-test of 50 actual food service patrons using an online questionnaire survey was used to test the validity of the experimental measures given, with respondees watching a 2.5 minute video on drone food delivery services that explains system and general operation method before the survey. The results of data analysis indicated that all values of construct were greater than 0.70, giving a high level of correlation.

The main survey was also conducted through an online questionnaire survey via a market research company in Korea, through email to 2,794 respondents as having used delivery services in the last half year, for an at least more representative sample. From the in-person, 331 respondents were used for statistical analysis.

This concluded with an updated graph for needed specifics as measuring consumer response to drone delivery (see Fig. 2).

Data

Of 331 people, 58 per cent (n= 192) were males and 42 per cent (n= 139) were females, average age about 35, with the majority in their 20s (37.5%/n= 124), mostly single (56.8%/n= 188) and of a modest income of US$2,001-3,000 (22.4%/n= 74). Almost all also had at least a bachelor's degree (roughly 90%).[xiv]

Managerial implications

Chiefly, the effect of time as a factor in use of drone food delivery versus services shows that companies should explain delivery services to consumers in a simple manner via a user manual through the smartphones that are now used to place such orders most or almost all of the time. In particular, it is widely known that older people have more difficulty learning about new devices than younger people, meaning that companies should ensure that the video similar to what participants watched is available and useful for all age groups.

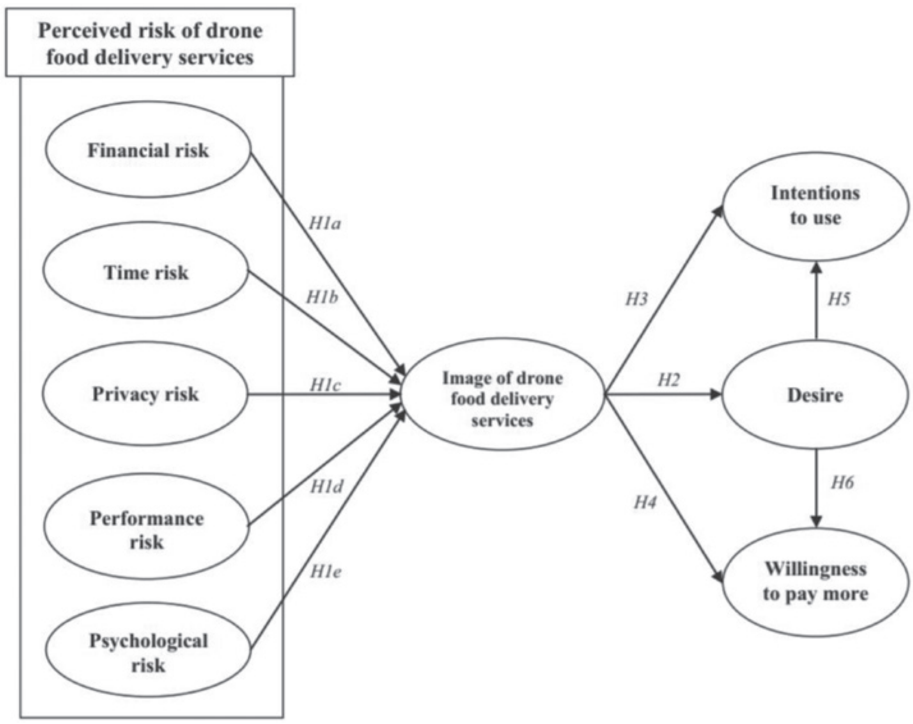

Figure 2.
Proposed model revision.[xiii]

Secondly, psychological risk caused by user perception of judgements of others can thereby be eliminated through both a good impression of drone food delivery services via their environmental greenness and also betterment of traffic accident rate as well. For a summary of the correlations and also user responses in a general manner, we give Tables II and IV below.

Construct and scale item	Standardized loading[a]
Financial risk	
The cost of using drone food delivery services is likely to be burdensome	0.975
Drone food delivery services are likely to cost more than I thought	0.960
I might get overcharged if I use drone food delivery services	0.952
Time risk	
The possible time loss from learning about using drone food delivery services is high	0.949
If I use drone food delivery services, I am more likely to lose time because of the switching to a different delivery service	0.955
It will take time to learn how to use drone food delivery services	0.893
Privacy risk	
Using drone food delivery services may not protect my personal information (e.g. credit card number, phone number, address, etc.)	0.974
Personal information (e.g. credit card number, phone number, address, etc.) when using drone food delivery services may be stolen by others	0.930
Personal information (e.g. credit card number, phone number, address, etc.) could be exposed when using drone food delivery services	0.946
Performance risk	
The probability that something is wrong with the performance of drone food delivery services is high	0.919
Drone food delivery services do not seem to perform well	0.899
Considering the expected level of performance of drone food delivery services, it would be risky to use it	0.920
Psychological risk	
The usage of drone food delivery services would lead me to a psychological loss	0.894
Using drone food delivery services would not fit in well with my self-image	0.923
Using drone food delivery services makes me feel anxiety	0.823
Image	
Overall image for using drone food delivery services is good	0.950
Overall image I have about drone food delivery services is great	0.960
Overall, I have a good image about drone food delivery services	0.916
Desire	
I desire to use drone food delivery services when ordering food	0.956
My desire of using drone food delivery services when ordering food is strong	0.961
I want to use drone food delivery services when ordering food	0.964
Intentions to use	
I will use drone food delivery services when ordering food	0.957
I am willing to use drone food delivery services when ordering food	0.899
I am likely to use drone food delivery services when ordering food	0.960
Willingness to pay more	
I am likely to pay more for drone food delivery services	0.951
It is acceptable to pay more for drone food delivery services	0.966
I am likely to spend extra to use drone food delivery services	0.973
Goodness-of-fit statistics: $\chi^2 = 551.732$, df = 288, $\chi^2/df = 1.916$, $p < 0.001$; NFI = 0.954, IFI = 0.978, CFI = 0.977, TLI = 0.973, RMSEA = 0.053	

Notes: [a]All factors loadings are significant at $p < 0.001$ NFI = normed fit index; IFI = incremental fit index; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root-mean square error of approximation; All items were measured on a seven-point Likert scale (1: strongly disagree, 4: neutral, 7: strongly agree)

Table II.
Confirmatory factor analysis: items and loadings.

		Standardized estimate	*t*-value	Hypothesis
H1a	Financial risk→Image	0.043	0.620	Not supported
H1b	Time risk→Image	–0.129	–2.322	Supported
H1c	Privacy risk→Image	0.054	0.829	Not supported
H1d	Performance risk→Image	–0.157	–2.594	Supported
H1e	Psychological risk→Image	–0.243	–3.896	Supported
H2	Image→Desire	0.786	19.378	Supported
H3	Image→Intentions to use	0.131	3.217	Supported
H4	Image→Willingness to pay more	0.086	1.041	Not supported
H5	Desire→Intentions to use	0.830	18.957	Supported
H6	Desire→Willingness to pay more	0.522	10.457	Supported

Goodness-of-fit statistics: $\chi^2 = 629.588$, df = 307, $\chi^2/df = 2.051$, $p < 0.001$, NFI = 0.948, IFI = 0.973, CFI = 0.972, TLI = 0.968, RMSEA = 0.056

Notes: $*p < 0.05$; NFI = normed fit index; IFI = incremental fit index, CFI = comparative fit index; TLI = Tucker–Lewis index, RMSEA = root-mean square error of approximation

Table IV.
Standardized parameter estimates for structural model.[xv]

Limitations: The Future

Apart from only using data from Korea (to be covered through Pakistan in the final section), the model has a need to also be tested in other fields with similar services: The Casa Madrona Hotel and Spa in California offers a "service to deliver champagne using a drone for customers in the outdoor pool"[xvi] for one noteworthy and simple example that also covers the gap that is the ratings of customers who have actively used such services, as they are currently rather rare and also localized examples as seen above (although perhaps these small examples might be condensed into a generalizable global rule until further developments in industry spread the effects among service industries).

Lastly, we now examine the consumer reactions as stated difficult to measure in the above study due to lack of actual data for Korea, although it is one of the countries where drones have thus far been sent on tested runs to measure (a rather small sample) of consumer responses, and so use Khan et al as our baseline measurement for how urban environments as the main 'victim' of these disruptive drones view them as a consumer base that will use them for deliveries and other services as a part of one day expected norms of the near future.

Drones on my doorstep?

Consisting of 4 main expectations, the study used a mix of inhabitants from 3 main cities in Pakistan via 307 subjects as sample for:

Hypothesis 1 (H1) as Privacy Concerns: If privacy concerns are low, consumers will have a more favourable response of drone delivery.

Hypothesis 2 (H2) as Safety Concerns: If safety concerns are low, consumers will have a more favourable response "…".

Hypothesis 3 (H3) as Level of Criminal Activity: Low level of criminal activities will lead to a more favourable "…".

Hypothesis 4 (H4) as Effect on Environment: Positive effect of drone delivery technology on environment will lead to positive "…".[xvii]

Cluster Analysis

Used to sort the found data sets into appropriate groups, the results were helpful for the needed customization of marketing campaigns as needed for the various consumer groups comprising the customer base that would use such services in the future. For the data, clusters were created via the demographic data (Fig. 5).

The Groups

The quality of the model, as can be seen in Figure 22, is fair, with three clusters comprising cluster no. 2 (47.9%), second largest as cluster no. 3 (27.7%) and cluster no. 1 (24.4%), with Fig. 23 showing that age employment status and gender are the main identifiers that separate each group.

Demographic Characteristics	No. Surveyed	% Total Respondents
Total	**307**	
Age		
18-24	149	48.8
25-34	71	23.1
35-44	62	20.2
45-54	20	6.5
55-64	3	0.9
65-74	1	0.3
75 or older	1	0.3
Gender		
Male	149	48.5
Female	158	51.5
Employment Status		
Employed	152	49.5
Unemployed	155	50.5
Monthly Income		
Rs. 49,999 or below.	46	15
Rs. 50,000 – Rs. 99,999	92	30
Rs. 100,000 – Rs. 149,999	92	30
Rs. 150,000 - Rs. 199,000	35	11.4
Rs. 200,000 – Rs. 249,999	11	3.5
Rs. 250,000 and above.	31	10.1
Location		
Islamabad	182	59.3
Rawalpindi	95	30.8
Other	30	9.8

Figure 5.
Demographic profile of respondents.[xviii]

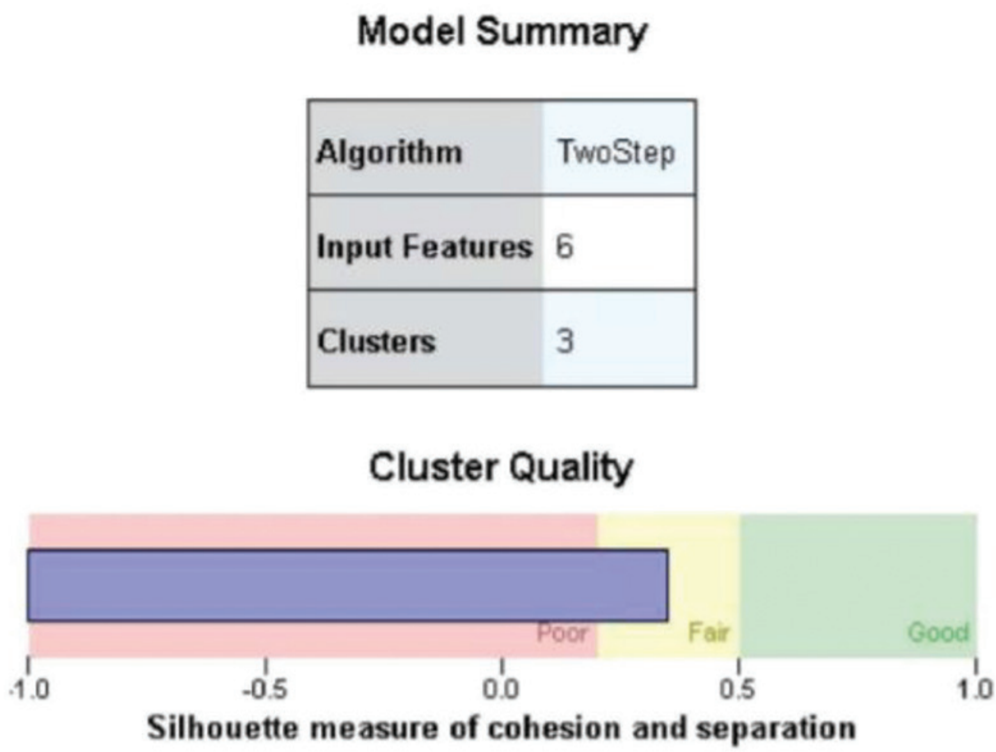

Figure 22.
Cluster Quality.[xix]

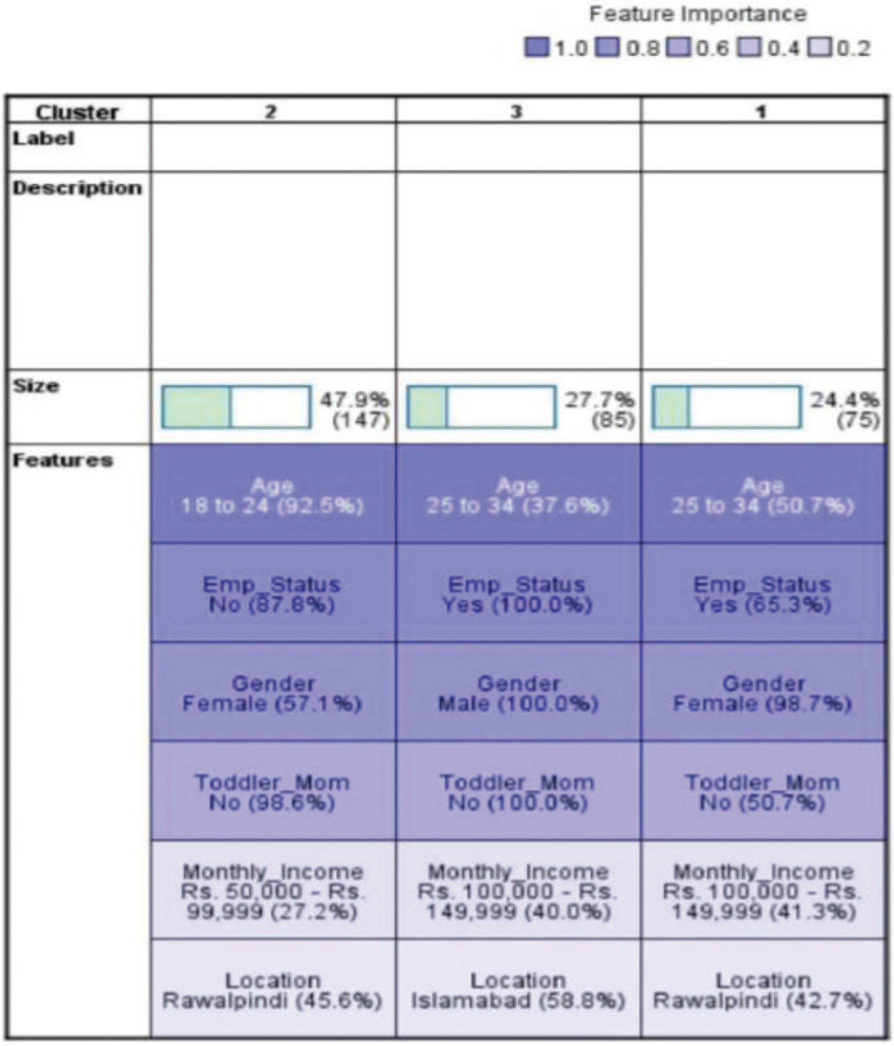

Figure 23.
Clusters Data.[xx]

The Clusters by Importance

Cluster 2 is mostly youth. Moreso young women (57.1%) of ages 18-24 (92.5%) as unemployed (87.8%) with a monthly household income of Rs. 50,000 – Rs. 99,999 (27.2%) as residents of Rawalpindi (45.6%).[xxi] Composed of students and recent graduates who live at home or have recently found employment, this group enjoys the use of new technology as an interesting pastime, and are also eager to new ideas or methods of learning, and have therefore been dubbed here as “Millennials.”[xxii]

The second largest that is cluster 3 is adults, all men (100%) from the ages of 25 – 34 years old (37.6%) and all employed (100%) with a steady income of Rs. 100,000 – Rs. 149,999 (40%) and residing somewhat in Islamabad (58.8%). Described as tech-savvy young men who enjoy the process of new technology as both a fun pursuit and possibly a work benefit that will make life easier, this group has been called the “Tech-Savvy Males.”[xxiii]

Cluster 1 is mostly slightly older women (98.7%) of 25 – 34 years old (50.7%), mostly employed (65.3%) and sometimes residents of Rawalpindi (42.7%) with an income of Rs. 100,000 – Rs. 149,999 (41.3%). Described as “Working Women” who see benefit in this technology as useful for reducing their already busy schedules so they can keep up a good balance of life and work pursuits, they thus like any new adaption of convenience, as any mothers usually do if such is the case as often is in developing countries, for slightly saved time and/or effort.[xxiv]

Cultural Factors as Influencing Drone Use: A Critical Difference

Perception versus the Target Audience

Analogous in this part of the world to the deadly military drone as used for both aerial surveillance and drone strikes in the Northwest and FATA regions, this leads to the "second -order effect" as being primarily negative via the killed civilians that bring to the mind of the community both the caused psychological damage of these strikes and the corresponding anti-American sentiment; seen as public demonstrations, anti-drone songs and diminished support for the government in Pakistan, this therefore shifts the market from the expected to the new.[xxv]

Instead of older individuals that would most benefit from the easier transactions provided by such drones, "Tech-Savvy males" instead become the most promising target for this new market due to different cultural factors based on the area versus in a Western country, for example. As common buyers of all products online from electronics to clothes and other needs, especially as family breadwinner even if unmarried in most cases, there might even be a perceived need for such ease for the convenience of elderly family members or an otherwise busy mother of the children as occupied at home in combination with the stable and more than adequate income provided by such working family members.

Also, Varying Payment Method(s)

Another difference found across cultures as greatly affecting transactions through technology or not is "that people in most developing countries prefer using cash on delivery as a payment method, instead of paying via credit cards."[xxvi] Used in about 95% of all online purchases, cash-on-delivery is common in many nations as a form of additional personal peace of mind, but is difficult to implement for such drone-based delivery services. To solve this problem in countries where cards are not a common occurrence, of which we can also cite the very developed Japan and Germany as having cash cultures and lack of card machines to prevent unwise spending, retailers can either inform customers of the secureness of credit card information to streamline drone use, or otherwise as many trust global but not local websites[xxvii] for fear of being scammed through card use.

Although a simple credit card scanner can be installed in delivery drones, it is my opinion that an alternative to completely bypass the need for unwanted card use is a simple conversion of the accepted money to digital and therefore safely encrypted means of payment such as Bitcoin or Monero for a modern and even safer alternative.

Another now common option is allowing customers to use mobile payments as a usable and liked form of payment in developing countries due to the extremely high rate of cellphone use paired with this very convenient and very safe form of easily-made payment.

Conclusion

From easy payments as a cultural factor to the general method of using risk mitigation to ensure that customers feel at ease when making decisions regarding otherwise very beneficial technology that not only makes services of food more efficient, but also makes general safety and other factors improved through reduced traffic rush and also other affects such as the rise of convenient technologies as less wary procedures by the general population as such advances are normalized. Here, although we see that each culture and therefore place of space has somewhat differing requirement for drone use as safe and efficient, that the general process is not only a good development for the future, but also a helpful and easy way to enjoy either a good dinner or an online purchase quickly delivered, as requested by the user.

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Endnotes

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