The Fifth Dimension: How Augmented Reality is Launching Worlds within Our World

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Abstract: Social media technology and corporate America are currently building an augmented reality (AR) dimension layered upon our everyday lives. A virtual world of augmented reality is being layered over advertisements, buildings, signs, clothes and more all over the world through the placement of indoor and outdoor tracking and the download of applications to your smartphones and tablets. 21st century activities such as device interaction, media management, gaming, and social networking are being combined with corporations to tag feeds to build "stories" among previously unconnected people. In physics, the term "fifth dimension," is a hypothetical extra dimension beyond the usual three spatial dimensions and one time dimension of Relativity. The research suggests the transformative implications for 5th dimensional learning anywhere in the world are within our reach through the use of augmented reality. This paper discusses the current building of augmented reality blended with visual searches, facial recognition technology and real time data, and the inevitable arrival of the 5th dimension. It investigates the human clout or how to measure individual "spectrum" rights when your virtual encounters and identity are extracted and used to teach the world. The "Recognition-primed decision model" described as the learning that occurs through tacit knowledge gained through training, education and experience. Research on "situated cognition" or learning that is embedded into the social and physical context within which it will be used will also be explored.

Introduction

There are many emerging technologies that learners in which have become accustomed primarily in online environments. Learners use a combination of 3G and 4G technology, wireless technology, GPS and search engines to log-on to courses and research information for assignments. Learners join university related and public social networks and share information to the world without a second thought. People can use technology as "virtual wallets" on the web where financial purchases, deposits and transfers can be made. Also, there are Quick Response Codes (QR codes) and learning games and apps with beginning prices as cheap as 99 cents. These are conveniences most of us have come to accept as the new normal.

However, these innovations are outdated compared to technology being built in the virtual world right atop your Internet interactivity. Currently, a new layer of augmented reality is being built with immediate interaction to your existing smart phone, tablet or television screen (oafrica.com, 2011). Augmented reality is essentially the visual overlay of information on top of real life. According to Dubois, Augmented Reality is a digital layer over the real world that you can't see with the naked eye but you can see with the camera on your smartphone or computer (2011). It can be argued this technology enters the users into a form of *cognitive apprenticeships* as it integrates into their activity and social interactions (Herrington and Oliver, 2009). Similar to QR codes, in which the smartphone tags result in entertainment and transportation ticketing, product/loyalty marketing and commercial tracking, augmented reality applications present simulated information, audio and video on street signs or a tracked historical location. Applications from companies like Twitter, Google + and Facebook Sponsored Stories are taking word-of-mouth observations based on users' tweets and status updates and then creating organic content that becomes real time newsfeeds. Now, Google Circles and apps like SocialCamera, FaceR Celebrity and SceneTap, which use information collected via face-detection cameras to display real-time stats at your local bar, have adopted the facial recognition technology (Greenfield, 2011). Augmented reality applications, like viewdle.com and aurasma.com, apply search engine optimization (SEO), run organic algorithmic searches, utilize near field communications (NFC) based on user smart phone activities. Hyperpersonalization and latitude can inform any entity with interest where you are and what you are doing. This merges squarely into the situated learning model because augmented reality coalesces with the user's community of practice (Herrington and Oliver, 2009) or where they actually live their lives. For example, if a user bought a coffee at Starbucks and used a smartphone to pay, that information will be immediately posted to all of his or her Facebook connections or trigger a simulation of a dancing Starbucks cup to everyone on the user's phone list. The research will now provide greater detail about these technologies and ways augmented reality can be used for learning.

Aurasma and Layar

Aurasma.com terms its augmented reality "auras." The application is pre-loaded with "Super Auras" in the backdrop of specific, real-world, locations in the world such as London, Dubai and others. The learner can also make auras from general or location images. The aura is then linked to an Aurasma animation, image or 3D model, or a video from blinkx or one of your own (Aurasma.com, 2012). It uses visual recognition technology, similar to Microsoft Kinect technology which is also in smartphones. Combined with GPS, compass, accelerometer and Internet connection, the technology combines sophisticated image recognition and a conceptual understanding of the 3D world to recognize objects and images (Aurasma.com/partners, 2012). The augmented reality recognizes the backgrounds and then applies the "aura."
Layar is an augmented reality browser that labels the things around the user as real time digital information. Through its use of GPS, accelerometer and compass, Layar works similar to other AR with the inclusion of hundreds of layers. Layar follows the digital

convention of search engine optimization and users select a layer from the local, featured or popular tab (LayarStudio.com).

Viewdle and NFC

Viewdle.com offers augmented reality by placing an application between smartphone cameras and the users. It has hand-free recognition on multiple platforms and offers real-time audio-visual posting to social networks, called "Motomash," (Viewdle.com, 2011) via smartphone. It offers photo and face tagging. NFC technology embedded in smartphones is being optimized to establish radio transmissions among devices and what are called a "tags." Viewdle also uses NFC in its "Third Eye" game where players interact with the game and remote users over smartphones. Current and anticipated uses of NFC mobile technologies include contactless transaction and data exchange through enabled devices (RFID, Bluetooth and WiFi) that can handle Google Wallet and MasterCard PayPass transactions.

Google Goggles and Search Engine Optimization (SEO)

Google Goggles is yet another mobile image recognition application that bases its searches on pictures taken by handheld devices (Wikipedia.com, 2011). The image can be a location, a barcode, or ISBN, and Goggles will provide a SEO search for images or video. Search engine optimization is not limited to these searches but also includes: Local searches, academic searches, industry specific and vertical searches.

According to Smartplanet.com (2012), augmented reality could transform web browsing through bringing the digital world to the physical world. The pattern and image recognition augmented technology, through aiming the smartphone at a product, can provide detailed instructions and diagrams of the device. It can help lost persons through its GPS component and much more.

Xbox 360 with Kinect technology

The technological marvel of augmented reality like Xbox LIVE and Kinect are only secondary to the developer's emphasis on its usage of human-to-human communication. The motion tracking abilities of Xbox Kinect have valuable applications for physical therapy and home rehabilitation exercises. Doctors and patients connect through Xbox Live with rehab courses prescribed, graded, and assessed (Niehaus, 2010). The speech recognition filters out background noises from the user's voice using an engineered audio cone around the user's body even if they are moving. Kinect also has facial and eye recognition through biometrics, offering information security of copyrighted materials, curriculum and training. In business and government, Kinect can assist in building skills that make collaborations and competition viable beyond the limitations of their immediate surroundings (DePriest, 2011).
Kinect is a controller-less platform that uses infrared, case-based smart technology that synchs with a gesture, facial expression, speech command or movement of the user. The Kinect system software employs breakthrough techniques which can automatically

identify users/ players. The Kinect sensor is a horizontal bar connected to a small base with a motorized tilt mechanism, designed to be positioned lengthwise above or below the video display. Therefore, the Kinect sensor's most important features are its "RGB camera, depth sensor and multi-array microphone running proprietary software," The sensing range of the depth sensor is adjustable, so the software can also automatically calibrate the sensor based on the player's environment, and accommodate for the presence of physical obstacles like furniture. Users can take their Xbox with Kinect to different locations, or classrooms, and it will automatically adjust to the new environment (DePriest, 2011).

Windows Phone 7.5 code named "Mango" is a software update to Windows phone 7 that includes augmented reality that allows interconnectivity to all other Microsoft devices: Xbox, Kinect, PCs and Windows tablets.

Microsoft is using Kinect technology to take on the challenges of education in global society. In South Africa, Microsoft is deploying Kinect technology to provide students an opportunity to enter the 21st century. Students suffering from literacy problems, reluctant or shyer students are gaining confidence from using Kinect, including its avatar technology to build skills that will make them viable beyond the limitations of their surroundings (DePriest, 2011).

Applying Situated Learning to Augmented Reality

Learning, in the 21st century, is changing in swift and monumental ways. Educators are looking for ways to actively engage students in the learning process through incorporating some type of guided discovery (Mayer, 2004) that applies to the environment in which the learning exists. This method of teaching has its origins in the constructivist theories with its underlying premise that learning is an active process. Situated learning distinguishes itself from constructivism by allowing an individual to learn by socialization, visualization, and imitation (Hung, 2002). Learning begins with people trying to solve problems. Augmented reality is marketed as assisting people trying to solve problems. Situated learning moves from the role of passive observer to a fully functioning peripheral participant (Herrington and Oliver, 2009) in the learning. Applied to augmented reality on smartphones and the external environment through the camera function, the surroundings are labeled with instructions through an application on the phone. Learning occurs through the augmented reality tags or hypermedia explaining the surroundings. Augmented reality fulfills the basic components of situated learning through layering advertising and instructions that teach and assist the users with information needed at the moment. For example, if a user is traveling to Paris for the first time and is standing at the Champs Èlysèes, they can open the application which will layer that landscape with an augmented reality of that landscape. The user lines up the augmentation with the actual surroundings until both are seamless. Then, the application provides tags which "title" the restaurants, the tourist attractions, the police department and much more.

The other aspect of situated learning theory is that the experiences require an expert to measurably transfer the knowledge (Lave and Wagner, 1991). It could be stated that these experiences, and more importantly the experts that affect attention during these experiences, are now the tools and technologies used by a socio-cultural global society. Meanings, given to these experiences, are shared by the collective group (Media, 2012). This includes smartphones, iPads, gaming consoles and online learning – all of which – apply some form of augmented reality.

Expert systems, a form of artificial and business intelligence are also integrating with the augmented reality and education. As previously noted, the applications that layer upon the camera function on smartphones includes space where augmented advertisements marketing consumer products is currently being purchased by corporations in anticipation of this new arena of consumer contact gaining traction. Businesses using augmented reality benefit from the combination two very different dynamics; the perception of personal exclusivity and a multi-dimensional, sensory experience (Dubois, 2011). Put differently, businesses have an opportunity to isolate the consumer first and present the products through the user's personal smartphone cameras without distractions. This has meaning within the Affective and Psychomotor Domains of Blooms' taxonomy (Blooms, 1956) which describes the way humans receive and respond to phenomena and sensory cues. The combination of augmented reality, presenting as phenomena that affects the user's sensory cues, is distinguished from Bloom's only in the user's awareness of the cues but not in the adaptation-to-origination or higher level processes of the psychomotor responses. Individuals modify or adapt movement patterns to fit the special requirements of augmented reality. Individuals also originate new movement patterns, such as thumb texting or swipe gestures, to fit a particular situation or to solve a specific problem using augmented reality. In Bloom's new highest domain termed Creating, individuals build structures or patterns from diverse elements. Pattern recognition is a key component in the fusion between augmented reality and the four-dimensional reality.

Inc.com examples the Florida tourist industry in its use of QR codes in partnership with JetBlue Airways on New York City subways during the winter season. The industry offered a free trip to a Florida resort and subsequently allowed users to picture themselves in the many local attractions (from beaches to the brand new Dali museum), all accessible on their computers and shareable on social networks (Dubois, 2011). It could be argued that business intelligent advertising, through augmented reality, is a form of expert blended with active persuasion, which leads to a form of learning.

Expert Cognitive Processes and Tacit Knowledge

The military has been working extensively in researching how decisions are made quickly in war environments. In 2002, the Recognition-Primed Decision model has been used based on based on pattern recognition gained or tacit knowledge through training, education and experience (Bushey and Forsyth, 2006). The premise of the model states that in dynamic, uncertain, high-stakes, and time-pressured situations, it is experience and intuition that lead to a decision or course of action, not rational choice (Ross, 2006). The expertise within the individual immediately recognizes if the situation or surroundings

are familiar or typical which queries or brings forth a situational prototype. Ross defines the prototype as a cognitive package that includes the type of situation this is, what to expect from the situation (expectancies), suitable goals, typical courses of action, and relevant cues (2006). The cognitive package strongly aligns with situated learning. Augmented reality joins with the individual's tacit situations (riding the New York subway to work, for example) and the individual's tacit use of technology (smartphone, iPad, etc.) and triggers the cognitive package or situated learning mechanisms individual's use to make quick decisions. In education and in business, these individual mechanisms, leveraged through augmented reality, lead directly to decisions that involve no comparison of options because the situation prototype is linked to a course of action that the expert or individual already knows will work (Ross, 2006).

Conclusion

The potential for learning through augmented reality is emerging in new and interesting ways. Currently, augmented reality is being applied to mobile devices as a digital application to enhance or optimize the user's experience of the physical world. Learning has become an application or tag away; as the physical world becomes a virtual learning environment. The physical environment is now layered with augmented real dimensions where learners can collaborate with peers; receive instructions and diagrams on complex hardware, visit prominent locations globally, or have a Starbucks coffee waiting for them prior to entering the store. In more experiences than we recognize, the individual's cognitive processes and the tacit knowledge, are already blending with augmented reality.

In the last two decades, physical learning environments have had to adjust to the onset of online learning environments. Now, online learning environments will have to come to terms with augmented reality. Learners are seeking quickly absorbable and active knowledge, not in a static classroom but through situated learning or the cognitive package; prototyped in the mind through aggregated experiences. Augmented reality blends the Internet capabilities of virtual technology with the physicality of the traditional classroom by creating layers of audio, videos and simulations in a 21st century life that has become dynamic, time-pressured and demanding of quick decisions. As a result, a dimensional shift in the space and time required for learning to occur and the requirement for directed learning, is emerging. The research suggests a fifth dimensional affect is taking place in current learning paradigms through the augmented reality world within our world.

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