Chapter 7

Trusted Autonomous Game Play

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7.1 Introduction

Just as play is the engine that gives a game life, so autonomy and trust have always been fundamental requirements for and enablers of all play.

Let us deal with autonomy first. Santayana [1] defines play as “..whatever is done spontaneously and for its own sake”. Salen Tekinbas & Zimmerman [2] state “Play is free movement within a more rigid structure.”- almost, in fact, a definition for autonomy itself. Gilmore [3] defines the term play as: “Play refers to those activities which are accompanied by a state of comparative pleasure, exhilaration, power and the feeling of self-initiative.” Speaking of games Schell [4] states that “Games are entered willfully”, while Avedon & Sutton-Smith [5] state “Games are an exercise of voluntary control systems...”.

What then of trust? Huizinga [6] in his seminal study of play across cultures and periods of history defined a core feature which he coined as the Magic Circle. The magic circle delineates the mental space or universe created by players of a game. It defines the boundary between the real world and the game world. Critically, ‘inside’ the circle is safe - trusting and trusted - play of the game. This powerful concept has come to underpin much of the modern theory around game design.

So, trust and autonomy as individual concepts underpin all game play. Autonomy, because players of their own free will and volition choose to play the game. As Sid Meiers famously said [7] “[a game is] a series of interesting choices.” - the operative word being choice. Trust, because players trust they are entering a shared virtual space defined by the rules and objectives of the game and that the other players - whether opponents or teammates - will share the ‘purity’ of that purpose, the willingness to abide by the rules and play the game ‘for its own sake’. This psychological state or attitude is known as a lusory attitude [8].

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The concept of a game is very broad; encompassing as it does sport in its multifarious forms (from individual to team, motor through to track-and-field, on or under water or in the air or on a field, ancient versus modern, extreme, etc.); board (e.g., Monopoly or Ticket to Ride), table-top (e.g., Warhammer 40 K or Dungeons & Dragons), and card (e.g., Bridge or Poker); gambling in its various forms; social (e.g., drinking games or storytelling); games of childhood and the playground (e.g., ‘tip’ and chasings, hide and seek, brandings, etc.); as well as the primary focus of this chapter, digital games (i.e., including the categories or labels of computer game, video game, console, mobile or smartphone and web). Numerous people ranging from academics working in the field of game studies, through practicing game designers have provided definitions for what is a game. While definitions such as Costikyan’s [9] “An interactive structure of endogenous meaning that requires players to struggle toward a goal” or Tracy Fullerton’s [10] “A game is a closed, formal system, that engages players in a structured conflict, and resolves its uncertainty in an unequal outcome.” are succinct and subtly nuanced; Schell’s 1st definition from his Game Design book [4] as a set of traits or attributes seems one of the most complete and least controversial or open to argumentation. Paraphrasing “Games: Are entered willfully; have goals; have conflict; have rules; can be won and lost; are interactive; have challenge; can create their own internal meaning; engage players; and are closed, formal system.” McGonigal also shares a similar approach; though her list is even shorter [11]: “When you strip away the genre differences and the technological complexities, all games share four defining traits: a goal, rules, a feedback system, and voluntary participation.”

But what is the significance of Trusted Autonomy to digital game design & play? What challenges and opportunities exist (for Trusted Autonomy) in the new types of technologies and game types & game play that are emerging?

7.2 TA Game AI

One long-standing, and apparently obvious area where Trusted Autonomy could make a true impact in game execution and game environments is AI - Artificial Intelligence - opponents, team-mates and characters to play along-side-of, against, and to inhabit the imaginary game worlds. A superficial glance at the intersections of computational intelligence and renowned cultural games of the intellect such as Chess or Go would seem to indicate that the ‘AI challenge is solved’. In particular IBM’s Deep Blue triumph over chess grandmaster Gary Kasparov in 1997 [12], and most recently Google’s AlphaGo triumph over Go grandmaster Lee Sedol in early 2016 [13] mark turning points for computational intelligence; showing its ability to exceed the highest levels of human performance in abstract games of reasoning.

While there is not yet consensus within the academic community about the scope, range, type and enablers of human intelligence; there does seem to be broad agreement that human intelligence is much more than simply logical and mathematical - with visual/spatial, inter-personal (emotional), linguistic (language), and kinesthetics

(bodily) being widely recognised (e.g., the theory of multiple intelligence [14]; or the Cattell-Horn-Carroll theory of intelligence [15]).

Further, and clearly, many of the games humans play require and utilise intelligence other than logical & mathematical. Indeed most, but not all, games are social activities and often at multiple levels (e.g., consider a team-sport where there are social elements at the intra-team and inter-team levels, and between players and officials, and perhaps between players and spectators). To express it another way, the greater share of games require a focus upon and awareness of the other participants of the play activity. In a multi-intelligence view this entails a minimum level of social and emotional intelligence to be an effective participant in the play (game) activity. In particular this requires active sensing and situational awareness of the other participants and modelling of their motivations, objectives & goals, and future intent and actions (e.g., an application of theory of the mind [16]). These are exactly the same attributes and requirements for effective Trusted Autonomy teaming of humans and computational intelligence actors.

As such advances in the technological underpinnings of Trusted Autonomy; and in particular those centring upon machine modelling and understanding of human intent, behaviour, trust, and emotional state; will find ready application as richer, more responsive, AI in digital games. That is game AI displaying a broader range of human behaviours and intelligence, with those behaviours more responsive and appropriate to the actions and choices of the human players. Computational (AI) team-mates and opponents that are indistinguishable from humans (Viz. Turing Test [17]), and richer NPCs (Non-Player-Characters - AI protagonists and entities in the game world) who truly interact with and respond to a player's in-game actions.

7.3 TA Game

Beyond in-game AI, the game 'itself' (i.e., as a system) could and should display the same level of awareness of and adaptability to the player and his or her state. The implications of such an approach for the way games are designed and developed are profound.

Jess Schell [4], in his book on game design, makes clear that "The [game] designer creates an experience . . . The game is not the experience . . . The experience rises out of a game." In other words the game serves as a vehicle - constructed by the game designer and their team - to transmit an experience to the player of that game. In Schell's words [4]: "And it is this that makes game design so very hard . . . we are far removed from what we are actually trying to create. We create an artefact that a player interacts with, and cross our fingers that the experience that takes place during the interactions is something they will enjoy." Further, that 'experience' is by its nature subjective and unique to each player, as it must of necessity be filtered and interpreted through the lens of each individual player's personality, tastes, intellect and current state (at the time of play), and motivation.

Game design and game development as practiced today is intensely *a priori* in nature. The designer conceives the core play mechanics (the way the world will work - its 'physics' - and its challenges), the setting, the story, the interface, the characters that inhabit, and the locations of the world, the look and feel. Through the development process these are further elaborated - 3D models are created for terrain, vegetation, buildings and characters; dialog is written for characters and recorded by voice actors; music is composed and recorded; logic is devised for game AI and coded by programmers, etc. etc. All this is decided, codified, and locked-in via a resource intensive development process (typically for AAA games across a period of 12–24 months and through the skills of 50–150 specialists) before the standard player ever experiences the game. Further, patches & DLC (Down Loadable Content) aside, that content is immutable and the same for every player who experiences that game.

But what if the game was aware enough of the player and their play goals, & self-aware enough to work in partnership with the player to create the best possible experience for that player at that time? What if the game software/system and the player were in a Trusted, Autonomous configuration with the goal of creating that optimum experience?

This would require a significant re-engineering of a game. Significant resources would need to be dedicated to embedding computational intelligence within the game - monitoring & modelling the player from moment-to-moment, prediction of desirable future game choices and environments to maintain engagement by the player, and JIT (Just In Time) creation of game content (stories, challenges, characters, dialogs, locations). This is extremely challenging. On the other hand there would be significant savings in the reduction or elimination of all the resources dedicated to development of game assets (the levels, dialog, music etc.) prior to release. Further, each game would ideally be a unique, tailored, and bespoke experience prepared (potentially, spun moment to moment; a kind of spontaneous but synchronized and continuing 'jam session' or conversation between the player and the game) with the individual player's motivations for play and individual tastes in mind.

Certain enabling technologies exist as building blocks for this vision. The concept of Flow [18] offers a framework in which to evaluate player engagement and interest as the game and player undergo changes. Procedural content generation [19] is a computational approach for the generation of simulation or game content - including terrain, vegetation, architecture, and even story (e.g., [20]). Bringing these foundational technologies together with low-cost and minimally intrusive sensing of the player's state (ideally physiological and EEG coupled with the already available in-game choices/actions) is challenging but not insurmountable.

7.4 TA Game Communities

One of the more popular forms of online game play today are what are known as MMO (Massively Multi-player Online) and simply Multiplayer (typically 1st person

shooter) games. As an example the game League of Legends boast 27 million players each day (67 million players each month and a daily maximum simultaneous players of around 7.5 million - Riot Games [21]), while steamcharts.com [22],- a website that tracks player numbers in all games managed by the Steam application¹ - shows two other games with simultaneous player numbers in the hundreds of thousands (Counter Strike: Global Offensive - peak number of simultaneous players in July 2016 of 636,056 and over 255 million hours played in that month; DOTA 2 - peak number of simultaneous players of over a million for July 2016; and number of hours for July over 443 million) and dozens more with over 10 million hours of play for July 2016 (e.g., Rust, Team Fortress 2, Rocket League, Grand Theft Auto V, Arma 3, ARK: Survival Evolved). This is but a subset of popular online multiplayer games (e.g., War Thunder, World of Tanks, World of Warcraft also have very large player bases).

Arguably the most serious challenge for these online communities of players (and the companies that provide and profit from the games) is what is known as toxic behaviour [23]. Toxic behaviour includes harassment of fellow players (verbal abuse that includes racist, sexist, and sexually offensive language) and deliberate ‘griefing’ - the sabotage or corruption of a game being played by the perpetrator and others. Certain games and their communities (including League of Legends) earn a reputation as particularly toxic - deterring new players (newbies) from joining, and leading experienced players to quit the community; though this is a problem shared by all such games (and indeed online communities) to greater and lesser extents. Through the lens of Trusted Autonomy this challenge of toxic online behaviour and communities is one of creating a Trusted Autonomous environment for those players and the community. One in which a player can choose to join a game at random (the dominant form of play of these form of games, and known often as ‘solo queueing’; as opposed to joining a game as a pre-configured team) and trust that the Magic Circle is being maintained by the game and that the other players are there to play with a lusrory attitude.

The very scale of these games (e.g., for League of Legends several hundred thousand simultaneous games - each of 20–45 min - at any instant) and their player bases require an automated, computational-based solution. One which monitors and models each player’s behaviour and motivation in the short-term (e.g., within each game) and on a longer-term basis. Most critically a game capable of supporting a range of different motivations-for-play and able to offer roles and opportunities for players with different goals and motivations for play - while still maintaining a fair, enjoyable and safe gaming experience for all participants.

¹Steam is a desktop PC (primarily) based application for purchasing and maintaining a library ‘in the cloud’ of digital games. It is the single most popular and highest volume tool for this purpose in the Windows PC environment and manages some of the most successful/popular games - but not all such games.

7.5 TA Mixed Reality Games

At the time of writing *Pokemon Go* from Niantic/Nintendo (The *Pokemon Company* [24]) has been released for less than one month (in most of the world less than that period). A mobile (Android or iOS) based game, it has proven a social phenomenon receiving massive amounts of media coverage due to its impact upon social behaviour and use of public spaces, and proving to be immensely popular (e.g., App Annie reports over 100 million downloads of the application in the first 3 weeks of release [25]).

Pokemon Go is labelled an Augmented Reality game; but is more accurately a mixed reality, or indeed Reality Augmented Game (RAG; i.e., the virtual environment of the game is the primary focus and stimulus, while the real-world serves to augment that imaginary space). Abstracting out particulars, players move through the physical environment but observe a virtualised version of the physical world upon their mobile device. It is in this virtual space that players interact with monsters (wild *Pokemon*) and locations of interest (gyms and *PokeStops* - these later corresponding to actual locations in the physical world such as a museum or other major building). Hence the primary cognitive focus of players is upon the virtual space displayed upon their device - not the real-world around them.

Already there can be found multiple news stories concerning misadventure suffered by players of *Pokemon Go* - deaths (struck by a vehicle, wandered into a dangerous area of the city and murdered), injury (falling off a cliff or being struck by falling debris), robbery (criminals waiting at out-of-the-way locations frequented by players and robbing them of their cash and personal effects) - as well as less traumatic but also non-trivial social impacts (stresses on public services and facilities, disturbances to residents and special locations in the real-world such as cemeteries or places of particular reverence).

As with the previous examples, there is a clear need to recast such mixed reality games - where so much of a player's finite cognitive capacity is dedicated to the game or imaginary space - as a trusted autonomous relationship between player(s) and the game. Future versions of RAGs should work to provide a safe - trusted - experience for the players. This in turn will require a computationally intelligent game; one not just aware of the virtual world but the physical world through which the player moves; and which utilises that information to keep its player safe (and the world safe from the actions of its player).

7.6 Discussion: TA Games

Several examples of significant changes to the way games are designed, developed and played have been proposed based upon adopting a Trusted Autonomy framework or approach. In particular Trusted Autonomous AI to play with, against and as occupants of the virtual works; Trusted Autonomous games that self-modify to present

the play opportunities of most interest to the players; Trusted Autonomous online game communities that offer fulfilment for different player types while maintaining a safe and trustworthy environment; and Trusted Autonomous Reality Augmented Games (RAGs) that keep their players safe in the real-world while much of their players' attention is focused upon the virtual space.

Common to all approaches is the need for games to become 'smart' and become 'aware' - to be cognisant (sense or monitor) the player, their community, and environment; and to use computational techniques to dynamically alter their own behaviour and interaction with the player so as to satisfy those goals.

The challenges are large; but with continuing advances in sensor technologies, modelling techniques & algorithms, computational power, big data and cloud computing, and HCI this vision is realisable and promises an exciting new era for digital gaming.

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