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Experts At Play: Understanding skilled expertise

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Abstract

Developing from David Sundow's accounts of expertise, this paper examines the gameplay of Counter-Strike, a popular online game. While Counter-Strike at first may seem an unsophisticated pursuit, players display remarkable dexterity developed through many hours of play. Through participating in gameplay and analysing videos of gameplay, we examine Counter-Strike as an example of expert technology use. Players move beyond the mere physical prowess of chaining their movements with the environment, they develop a sense of the terrain of play as a contingent tactically oriented understanding, rather than as static spatial knowledge. Relatedly we provide the beginnings of an alternative account of both games and expertise which brings out something of what it is to play a specific game as against games in general. Moreover rather than a disengaged general model of skill the paper considers how we might access and describe the situated skills of gameplay.

Keywords

ethnomethodology; phenomenology; expertise; Counter-Strike; interaction

Introduction

Games play an important role in modern culture. The effects of games upon culture, childhood development and social relationships have all gained considerable academic attention. Studies have variously documented the social side of games such as the social organisation of online environments, the nature of conversation online, and how these environments support enjoyable interactions (e.g., Brown and Bell, 2004; Moore, Ducheneaut and Nickell, 2006; Ducheneaut and Moore, 2004; Muramatsu and fAckerman, 1998; Nardi and Harris, 2006). Studies have also been examining creative player activities (Wright, Boria and Breidenbach, 2002), the development of 'economies' (Castronova, 2005), friendships (Yee, 2001) and, more negatively, addiction (Yee, 2002). Considering the large number of hours spent playing games it is clear that gameplay has importance as a new form of interaction. Moreover, broad lessons can be drawn from understanding the details of games: studies of games such as chess, and game-theory more broadly, has proven foundational for a number of research fields.

There exist a couple of unusual gaps, however. Firstly, games research for the most part focuses on games that feature long-term persistent environments (e.g. Star Wars Galaxies (Ducheneaut and Moore, 2004), Everquest (Moore et al., 2006), World of Warcraft (Nardi and Harris, 2006), or There (Brown and Bell, 2004)), with only a handful of examples examining other popular genera of games such as first-person shooters (FPS) (e.g., Manninen and Kujanpää, 2005; Wright et al., 2002). Secondly, there are few studies of how games themselves are *played*. Video games involve skill with sophisticated software, often in complex virtual environments. Whilst existing literature focuses upon social relationships formed online, the creative activities of players around the game, the nature of conversation online, the identities and plots produced, or the learning experiences of players, and so forth,

there is less documentation and investigation of the intricacies of deft gameplay—i.e., the very thing that attracts players to FPSes.

A core component of FPS experiences is the pleasure obtained from the player's engagement and gradual mastering of the game mechanic (Salen and Zimmerman, 2004). While much can be said about the cultures of games, their commerce and development, we ask here what the essence is of learning to use a complex device, of playing it well, and with others.

This paper addresses this question by presenting and describing some of our fieldwork, with a particular focus on two episodes of Counter-Strike play. Our analysis will cover a variety of concepts for understanding expert gameplay: how players produce moves in the game, how they come to learn and engage in the terrain of play, and how the cooperative and conflictual arrangement of the online game supports the reflection on, and development of, a player's skill.

Before engaging in presenting the vignettes, however, this paper will sketch out the basis for existing studies of expertise.

Studying experts

There exists an extensive body of work concerned with examining skilful performance (e.g., Chase and Simon (1973); Clancey (2006); Dreyfus (2002); Ericsson, Charness, Feltovich and Hoffman (2006); Ericsson, Krampe, and Tesch-Roemer (1993)). Many of these studies have focused either on exceptional 'outlier' experts (e.g., chess grandmasters in Chase and Simon (1973)) or comparisons between expert and novice practices (e.g., Proffitt, Coley and Medin (2000)). Elsewhere a common approach is to model learning and skill, in forms such as cognitive load theory (e.g., Sweller (1994)), or deliberate practice theory (e.g., Ericcson et al.

(1993)). Each of which seek to explain why experts display superior ability. In these theories skill is described in terms of cognitive processes, theories of memory, information processing and framed in terms of theoretical mental structures. Metrics have been developed from laboratory-based experiments which measure experts and their techniques, such as the speed at which a technique is acquired, the relationship between age and performance, methods of instruction, amount of practice, and so on.

While general characteristics of expert performance and learning have been identified in this work there are few examples of the examination of situated expertise. As Clancey notes, cognitive scientific approaches to expertise have largely ignored the ecology of social settings in which expertise is exhibited (Clancey, 2006). Moreover, this research frequently centres around metrics of skill, without necessarily appreciating the practical reasoning that constitutes each game. Indeed, literature on games has a tendency to ignore practitioner's acquisition, recognition and display of skill in favour of objective metrics. In other words, the focus is on measuring experts and their expertise, rather than the local production and recognition of expertise.

In ethnographic studies of work, we find the detailed examination of expertise, technologies and their ecologies (e.g., Orr (1996); Ingold (2007); Harper (1987)). The use of ethnographic techniques usually applied to workplaces to study games has become more common. An example of this is the growing corpus that examines ubiquitous and performance games, the work and skill involved in their play, and in running the game (e.g., Crabtree et al., 2004a; Crabtree, 2004b; Crabtree et al., 2007). Our approach to studying Counter-Strike adapt from these approaches to skill and expertise in real-world, collaborative environments to virtual worlds.

Besides this ethnographic body of work, we have drawn on phenomenological accounts of skilful activity (Dreyfus, 2002), and in particular David Sudnow's work (1984, 2001). One of Sudnow's most important and oft-cited books – 'Ways of the Hand' – is an account of how he learned to play jazz piano. This work is distinctive in a number of ways, not least in how it develops an ethnomethodological approach to his creative practices. Sudnow's forgotten follow-up is a study of video game skill, 'Pilgrim in the Microworld' (1984). In this book, he sets out on a course of monastic self-instruction in what seems on first glance to be a highly straightforward video game: Breakout (Figure 1). The book, like the game, is relentless in the pursuit of the methods of, and for, successfully playing Breakout. That is, the developing work of play that makes up this particular game, the consequences of particular actions, what actions can be considered similar for the purposes of the game, and—of course—what eventually will result in winning.

Ethnomethodology and other social scientific approaches that draw on phenomenology (e.g. Ingold 2007) have developed as a distinctive alternative to the focus in sociology on 'methodical' work that is produced through the application of standardised methodologies in order to generate systematic studies. Rather, ethnomethodology takes as its primary subject the methods of those being studied. This commitment entails that its practices for reporting and analysing adapt to whatever is being studied. Ethnomethodology, though a longstanding approach, has been gaining attention recently in a diversity of fields outside of sociology, in part because of the tools it provides for studying the details of social situations.

Not only are salient and overlooked details uncovered by ethnomethodological studies, they revitalise a post-positivist approach to empirical research (Laurier and Philo, 2004; Goodwin, 2000; Laurier, Whyte and Buckner, 2001; Lee and Watson, 1993). In these studies, as with ethnomethodology more broadly, one finds a focus on what Garfinkel has called 'the missing what' (Garfinkel, 1986) of ordinary, expert, creative, judicial or scientific activities (to

mention a few). They reveal that the massively prevalent, yet intricately varied structures of how numerous lifeworlds and workplaces are arranged, structures normally taken for granted in their 'business as usual' character for members are sustained by the ongoing efforts of those self-same members. These structures are susceptible to be either taken for granted, ironised or exoticised in academic work. To give a sense of what ethnomethodology takes as its subject matter: how we organise speaking together (Sacks, 1992), speak in public (Atkinson, 1984), walk together (Ryave and Schenkein, 1974), work together (Button, 1993), attribute motives (McHugh, Raffel, Foss and Blum, 1974), break the law (Sacks, 1972) or cry (Beach and LeBaron, 2002). So, for example, when we converse we do not usually all talk at once – we structure conversation using a turn-taking mechanism to select one speaker after another (Sacks, Schegloff and Jefferson, 1974). As in these examples, and others, members' activities are recognisably structured and those structures are formed from the material practices and accomplishments of members. These are the formal structures that ethnomethodology has studied – something of an inversion of the notion of 'structure' as it is commonly deployed in the social sciences (Garfinkel, 2002).

'Pilgrim in the Microworld' inherits its perspective from ethnomethodology and is one that thus presents an unusual and distinctive approach to studying games. Sudnow becomes his phenomenon: he hangs around arcades, plays the game with his children, and for long, long hours immerses himself in playing game after game of Breakout. His focus is on how an array of moves develop and build upon one another through long term play – how his strategies and tactics change, how his initial acquisition of dexterity in the game goes further as he slowly comes to grasp the nature of the game. This nature at first appears unpredictable, however is not without its predictability, and Sudnow begins to develop different strategies in order to play out to the end game. Ultimately he produces not a generic model of play, but an incredibly detailed account of how to play Breakout which respecifies generic models of

gameplay in a number of ways.

Like a number of ethnomethodological studies, Sudnow's approach is *post*-phenomenological (Lynch 1993), in that he takes phenomenology's focus on the organization of the experiential but makes it an empirical rather than a philosophical engagement.

Counter-Strike

Following from this body of work, we have focused our attention on one popular multi-player video game: Counter-Strike: Source (which we will refer to as 'CS'). CS is the world's most popular 'first person shooter,' a genre of games that involve navigating a 3D virtual environment, with the goal of eliminating other players. CS was originally developed in 1999 as a free modification to an existing game, Half-Life, later coming to be released as a commercial game in its own right. In an industry with a fearsome turnover of games and ideas, it is remarkable that CS continues to be played. With over three million regular players, playing CS is remarkably widespread game and form of human computer interaction. There is even an annual prize of $150,000 for the best CS player in the annual 'World Cyber Games'.

A player's CS experience typically begins with the selection of a suitable server on which to join a game (a list of active game servers is made available at the start of a session)[1]. The game itself is played on a particular set of 'maps,' each of which is effectively a self-contained 3D virtual environment. The player 'drops into the action' by joining a desired game, and being presented initially with a choice of two teams: terrorists and counter-terrorists. Players choose one of these 'sides' to play on as they enter the first round of the game. As CS works on a rounds-based system, the player must wait until the current round has ended before they are 'spawned' with the rest of a team at particular points on the map.

After ‘spawning’ players quickly buy their guns, armour and other any other equipment (such as fragmentary grenades or ‘flashbang’ grenades) and the round starts. Each map has a certain objective tied to it, such as planting a bomb, or rescuing hostages. The round ends either when the mission is accomplished, or when one side is eliminated. If neither of these situations occurs, a timer ensures the round ends within a few minutes (the timer starts at the beginning of the game, permitting two or three minutes of game-time). It is important to note that while players may die during a round, their team can still win by achieving the objective (e.g., hostage rescue) or killing all members of the opposing team. Correspondingly, a player may survive the round and yet their team may still lose by failing to achieve the objective.

Examining skill: a drop into the action

Our focus on the skill and gameplay in CS has led us to engage in studying the game with a close eye to the details of how play is organised by players themselves. As ethnographic background to our own comprehension of CS we played in the game (to a beginner’s level) acquiring a basic comprehension of the game’s proceedings and organised play which provided subtleties not obvious to those who observe only. Nevertheless, observations of others’ play, as we shall see, is part and parcel of learning to play the game (Lave and Wenger, 1991; Wenger, 1998; Hutchins, 1995). To provide us with insight into more experienced play and also to be able to examine in some more detail play as it unfolded we extensively observed one ‘expert’ player, recording videos of them engaged in the game, alongside discussions with them to clarify the recordings. Said ‘expert’ had been playing CS since it had been released for, on average, 10-12 hours a week over the course of a number of months. Whilst this player is not a member of an elite set of players or present on player ranking leagues, they are an expert in the sense that they have invested a great deal of time on

play, moved beyond simple competence and regularly achieve mid-to-high ratings on in-game statistics tables during sessions of play.

We have not sought a 'representative' sample or overview of CS play, but instead through repeated close examination of play, both our experiences and those that we have recorded, have attempted to understand what constitutes the expert play of CS. In a sense, then we have sought out what 'any player knows.' As well as drawing on Sudnow, our use of video materials draws on interaction analysis (Heath and Luff, 2000). From our data we present two short vignettes taken from our corpus, they are of typical situation of gameplay, our purposes are then to see what happens during two typical engagements with the enemy. In both cases, the player has been playing with 'strangers' online, for a number of rounds on each map, before the points at which we join the action.

Vignette 1: Shot from behind

This introductory fragment takes place on one of the most popular CS maps, '`cs_office`'. Here our player quickly runs across the map, exchanges fire with an enemy and is finally shot from behind:

> The round has just started, and terrorist players have 'spawned' at their start point. Our player rushes the short distance that will take him straight to the stairwell. Two other teammates are immediately encountered potentially engaging the enemy and visible here, one on the far-side of the room and one directly in front of the player, as is the currently slumping body of what is recognisably a counter-terrorist who appears to have been recently dispatched (Figure 2, top left). The fellow teammates (A and B) are oriented perpendicularly (i.e., facing towards the end of the hallway) to the player, who is slowly edging down the steps (Figure 2, top left and middle). As the player performs this manoeuvre, his orientation also switches to the right whilst ducking as

he passes an opening in the wall (marked as (1) in Figure 3). Once the bottom of the steps has been reached, the player heads to the right (down the corridor), overtaking the co-player (A) who was immediately in front of him, and momentarily glancing at co-player B who is now on the other side of the corridor (Figure 2, bottom left, and marked as (2) in Figure 3).

The player comes to rest next to some crates and crouches down behind them. Then he edges around the large container (Figure 2, bottom middle and right), strafes (towards the 'firezone' marked in Figure 3), maintaining his aim at approximately the right height for any potential targets at the end of the hallway. Sparks then fly off the side of the container from shots fired by a now confirmed enemy. As the player slowly edges around the corner, firing shots, a lone enemy can be seen down the far end of the hallway, exposed to the player's line of sight. A short exchange ensues as they both fire, and attempt to get a bearing upon one another by strafing left and right. Within a second our player sidesteps back behind cover. Sparks then fly off the front side of the container, and our player turns round to the left to face the other large container. This glance reveals a team member (C) around the container's edge. On the basis of this glance the player turns around and reloads their weapon. However, this previously glanced-at 'team-mate' subsequently approaches our player and shoots him dead, in actuality being a member of the opposing team.

In total this entire round took just over 30 seconds. This short vignette illustrates the potential brevity of a player's life in the game. It also illustrates some key concerns for understanding the skill of play: the highly localised and manually dexterous 'ways of moving' around that virtual terrain; reading terrain 'at-a-glance'; tacit coordination with and awareness of other players; and, crucially in this case, exploitation of appearances by enemy players.

Moving competently. The crux of playing well is moving and managing one's own appearance and presence while playing. Movement in the environment is accomplished through manipulating the mouse and keyboard in concert. Manual dexterity is required to adequately control the avatar's actions within the virtual environment. For a typical configuration of CS, the mouse enables the player to direct their viewpoint and the trajectory of their motion as well as enabling weapon firing, weapon swapping (e.g., between a grenade and a handgun) and secondary weapon functions such as a scope or semi-automatic/fully-automatic modes. The keyboard in turn enables the player to grossly direct their movement forwards, backwards or sidestepping, as well as providing weapon reload, duck and weapon drop keys (to name a few).

Skilled movement involved in getting around the terrain is demonstrated in the vignette. The player rapidly moves around the local terrain deftly performing multiple actions in the course of his movement. Glancing, as the player does, is a decidedly nontrivial if very common action. In this instance, its accomplishment involves heading straight by pressing the 'forward' key, performing the glance with the mouse by moving it to the left and, as this is done, switching directions on the keys to maintain the current path by pressing the 'right' key, finally followed by pointing the mouse back to its original direction and heading straight once again. All this is achieved smoothly in less than a second. It is also an action that is produced with an orientation to the visibilities and perspectives of the local game terrain, shaped by boxes, the width of the corridor, and so on. 'Glancings' are seamlessly joined into larger sequences of action within the game. At the beginning of the vignette the player performed a similar glance combined with a ducking action as he passed a potentially dangerous gap in the wall. Both these glances are crafted with respect to the emerging appearance of the local terrain; the initial examination through the hole (seeing that the way ahead is 'clear') is the basis on which the player immediately moves forwards (where he

might otherwise pause if danger is suspected). While players draw on a repertoire of established moves—glancings, duckings, strafing and so on—these moves depend upon an analyses of the terrain's features to select what is a suitable move at each juncture. Players must carefully manage their presence so as to be visible to their own team and yet invisible to their enemies. In the vignette, the player knows that they will be vulnerable due to their potential visibility to enemy players—within shooting distance of the gap in the wall.

Chaining together these small actions into temporally and componentially longer sequences of actions, as seen in this vignette, is a major challenge for the progression to competence. Practically, this means coordinating movement, aiming and shooting in particular ways—and the building of seamlessly articulated sequences of action engaged in with the terrain, such as the short sequence of the player's motion exhibited here: down stairs, around a dangerous window, around a corner, and across open space. Timing when to shift movement, posture (e.g., ducking) and orientation are also central features of this sequence. Experienced players smoothly 'slip into' a position within the terrain as they duck, aim, firing and retreat away quickly, doing so in relation to the particular terrain. Speed of action is important with regard to these motions, as the reaction time required from seeing an enemy player to aiming and firing will almost always (fatally) be too slow when playing against experienced players. As such, a novice player is constantly out-paced, and rapidly dispatched, and the game can appear impossibly difficult to them. Even our expert player here is caught unawares at the end of the round by unanticipated actions of an enemy.

A developed competence in sequences of action and 'ways of moving' enables the player here to foreground the task of defeating members of the opposing team without reacting slowly or getting 'stuck' within this terrain when surprised..

Sudnow (1984) related similar experiences in describing learning to play Breakout; the development of manual dexterity (manipulation of the game's rotary paddle in that case) is only one part of this larger skill development, based around timings, patterns and sequences of action. There is of course a visceral pleasure for players that build these sequences of action into a series of successful attacks, so demonstrating a level of virtuosity (that is unevenly distributed across players) to co-players.

Collaboration. This brings us on to examine the collaborative work of play. Within the vignette our soon-to-be-killed player identifies co-players A and B's conduct as that of team-mates. Within the vignette they are identifiably team-mates thanks to a number of resources that are drawn on: their 'at-a-glance' appearance (terrorist avatars; see Figure 4 for two example models); their orientation sheltering against the wall and directed towards the end of the corridor (a prime place for enemies to set a trap); and finally their response to our player's arrival (not shooting at him). Team members do, however, concertedly coordinate their actions when in close proximity. In the clip they do not all clump together awkwardly in their traversal of the hallway, they maintain a virtual distance between one another in a fashion that establishes a 'line.' Lining up supports an 'order of attack,' with front players in more danger but in better positions to shoot, and back players in areas with restricted views, but more protection from virtual barriers and with their team-mates being more pressing and obvious targets. The players here also maintain their distance from team-mates to prevent 'friendly fire' incidents or simply getting in the way of each others' movements. The order of engagement is accomplished by players keeping visual 'tabs' on one another's location via dextrous glancings (as seen in the player's conduct) and sustained monitoring of the zone ahead.

Collaboration in the game extends beyond the visual, whilst players can of course see one another's virtual embodiment, they also hear footsteps, gunfire and pre-recorded audio that

players can trigger during a round (e.g., “stick together team”). It is worth noting that, whilst not demonstrated here in this vignette, besides this ongoing, largely speechless conduct, when playing as a “clan”, players use voice-over-IP (VoIP) features supported in-game to broadcast their speech to co-players and this noticeably improves their clan’s success in engagements with non-clan teams.

Nevertheless, the player here does not recognise his assassin at-a-glance. It is not simply that ‘a glance’ can fail because without prolonged scrutiny details are missed: the enemy deliberately exploits the looks of our player’s team by facing in the direction they do toward the enemy and not immediately revealing themselves by shooting.

Terrain. A last issue to draw briefly from this vignette is the notion of the ‘terrain,’ a term we have used implicitly in our description thus far. In order to understand this terrain, we must understand the use of ‘maps’ in the game. The maps in which rounds are played are three-dimensional virtual environments of which there are a limited number and that vary quite dramatically in popularity. Becoming very familiar with these maps is central to becoming an accomplished player. However, the term ‘map’—a plan view of a physical space—is somewhat at odds with how maps are experienced during play, namely as a virtual environment from ground level, with depth-perspective. Before the player has died in the current round, their experience is solely from this first-person-perspective. Once dead, they can watch (and cycle) through other currently-alive players’ eyes. The view can be switched to third person, or a free-look mode, in which the player can fly around the map uninhibited. In this sense it is possible to obtain an birds-eye view of the game area if the player moves far enough above. However the map is usually experienced and made sense of in the first person (as the genre ‘First Person Shooter’ would suggest). Although it has been argued that virtual environments in many senses ignore the embodied-ness of interaction (Dourish, 2002), here we find play embodied in a different sense—in, rather than on the map.

The vignette also illustrates how the terrain of the map is brought to life by histories of regular rounds of play. Even before a single shot is fired or there is confirmation of any enemy whereabouts, the player and co-players are navigating their way with care towards a known zone of engagement before the first enemy is definitely spotted. In the vignette the player is making his way toward a 'bottleneck' created by the spatial organisation of the crates and containers, where a current or previous engagement is confirmed by the dead body lying on the ground. Their histories of play give them an immediate expectation as to where bullets are likely to be coming from and what moves enemy players are likely to attempt (though being surprised by the enemy coming from behind reminds us that such expectations can be used against them).

Vignette 2: Sniping on the ramp

Our second example is played on the '`de_dust`' map and involves considerable sniping around parts of the game's virtual environment:

> The round starts with the player selecting a sniper rifle, rather than an assault rifle (as in the first vignette). The sniper rifle has very different characteristics such as a scope for close targeting and a limited firing speed. The player again follows a co-player, A (marked on Figure 5, top left), on their way to the 'ramp' section of the map. This area is a short distance from the start point and consists of a long shallow incline downwards that eventually goes underneath a wide bridge. On the other side of the bridge the ramp continues with an incline upwards. This particular configuration of the virtual environment means that the two teams regularly and expectably face one another along this ramp as the following action illustrates. The player reaches the top of the ramp with their team-mate visible in front of them; as A continues down the

ramp, the player stops momentarily, ducks and zooms in with the scope on their rifle (Figure 5, top left, and marked as (1) in Figure 6). Following this they begin to walk down the ramp, quickly moving back from the scope view to their normal view, again trailing their team-mate.

The player halts at a box (Figure 5, top right, and marked as (2) in Figure 6), ducks, switches back to the scope view, and sidesteps to the right out from the box. After spending a short time looking through the scope, he walks backwards up the ramp, returning to their original spot at the top of the ramp (marked as (3) in Figure 6). Along the way, two other players become visible, one to the left and one to the right. Co-player A, far down the ramp is momentarily visible as the player retreats back up the ramp. On reaching a spot at the very top of the ramp, the player ducks again, switches to the scope and edges forward as he trains the scope on the bottom of the ramp in the distance. Some activity is then noticeable with co-player 'A' moving from left to right (and out of sight) at the bottom of the ramp, smoke gradually appearing and visible flashes (Figure 5, bottom).

Over the course of this, the change of angle rapidly reveals the ducking figure of another player which the player then fires at, and, after quickly repeating a sidestep-left-sidestep-right manoeuvre, returns to the crate's leftmost side, again edging slowly to the left until the enemy player reveals themselves by stepping out to the left. The player fires at this target, remaining this time in their position and continuing to hold their cross-hair at the end of the ramp. The player fires as the enemy target reappears from the side of the crate. After this firing, the player sidesteps to the right and back to the left again. Quickly, the enemy player sidesteps out from behind the crate, continues in sidestepping to reach the other side of the ramp, which also has a crate buttressed up against the wall edge. Our player fires off a shot at this moving target

whilst sidestepping to the right. Now the situation is reversed, our player points the scope's view at the edge of the crate on the far left. The enemy player edges out rightwards for a final fatal time from behind the crate, and our player fires at them. Zooming in instantly after the reload, blood splatter marks are visible on the ground near the crate.

We note finally that after this round's end the player repeatedly performs similar basic actions (going to the ramp's top with a sniper rifle, waiting for enemies) for six subsequent rounds.

This vignette echoes some features already discussed from the first example—such as the sequences of moves, rapid appraisal of terrain and co-player coordination through their stance and orientation in relation to the terrain. It also introduces some new features, illustrating how presence in the environment is 'extended' by virtue of co-players' activities, competence in individual weapons, the role of graphics in legibility and creating novel play, how play is conducted over a series of rounds, and how flashpoints of action form.

Presence and awareness. Players, whether they are members of the same team or enemies, act with special concern for whether and how those actions are seen by others—the visual accountability and the very invisibility of their movements in the game. Previously we saw how players attend to the actions of local team members in their movement around the terrain. Here we can see how team-mates also extend the player's awareness by acting as 'scouts' in the terrain up ahead. In attending to their actions and responses to the enemy, the player gathers clues as to the status of the enemy in the terrain, which our player does here via peering through the scope on the rifle at his team-mates' progress.

Moves exhibited by players within the terrain, such as 'rushing' in order to try and surprise enemy players before they can establish positions, probing the terrain for enemies (as seen

here) or retreating in order to reload safely, are intelligible to competent players as those self-same actions, and so inform their awareness of the nature of the local terrain. They provide information on where enemies are, good vantage points, routes, etc. Even as a dead body team members provide indications of enemy lying in wait ahead.In our vignette events 'in the distance' at the ramp's end here inform the player's current courses of action. When co-player A is *not* attacked in the popular sniping zone down the ramp, our player retains expectations of the risk of the ramp, even if they are not confirmed by a co-player up ahead being picked off. In terms of the moves, the enemy sniper may have not yet established their position or be trying to lure more of their opponents into the open before sniping.

During this sequence our player similarly minimises his presence to the enemy for the purposes of sniping. At a certain point he will have to risk visibility in order to be able to get a clear shot at the opponent, part of his skill is in waiting for the right moment to be in the enemy's line of sight and minimising that moment. In sniping, through practice, the player expects and knows 'what will happen next'—he aims at 'head height,' setting a trap with the rifle waiting for the enemy to walk through the gap presenting themselves formatted to be shot. Of course the clock is ticking and the enemy may well manage to avoid the gap.

The right tool for the job. In this vignette, the rifle's scope works in conjunction with the ability of the weapon to hit a target from a long distance. A marker of skill involves using the most suitable weapon for moves within the game.

Competence for a task such as sniping is constituted out of more than just aiming and aiming quickly, it also involves an appreciation for the varied implications of the weapon's use within the map being played. Each weapon has its own attributes and associated competencies required for successful use within the game. Different weapons imply that players must pass through terrain in different ways. The use of a sniper rifle might mean that

a certain route through the terrain is favoured, and that it becomes important to find a suitable location within the terrain to fire from, such that the player is shielded and can manage their presence (i.e., visibility of the player's avatar and sound from their gun). The skill of sniping involves location of an area with cover for them and an open space or a gap that enemy players will have to traverse (the bottom of the ramp in this example). The issue then is to view player conduct *in toto* (actions, weapon choices, etc.) as part of a concerted effort that is inextricably linked to the terrain and emerging moves of their team and the enemy. The various tradeoffs and balances between weapons, tactics and terrains then form both a central feature of this gameplay, and a central feature of the development of player skill.

Round strategies and flashpoints. The strategies and flashpoints are strongly linked. Teams develop their strategy over the course of a number of rounds, and it is tied to anticipating the recurrence of 'flashpoints'. They become those places where the action is and where strategies and counter-strategies play out.

Before and after what is shown in this vignette, our player repeats a course of action over a series of rounds, perfecting it and seeing how far he could get with it. In previous rounds the player had attempted a different route through the terrain. When he adheres to a repeated route and strategy (i.e., sitting at the top of the ramp and sniping) for some time, other players—both friend and enemy—also adhere to this particular route over the course of the subsequent six rounds. Consequently there is probing on both sides, and exploitation of predictable locations for sniping or attempting to outwit sniping. Players typically attempt many different routes and strategies 'through' the map; our player here could, for instance, approach the ramp by progressing down it with an assault weapon instead. During the course of several rounds, the players from each team reorient their conduct based on the success or failure of previous rounds. As we noted, the player goes on to attempt the very same sniping strategy many times after this vignette.

Probing and constant reorientation of strategies helps a team exploit deficiencies in the opposing team's distribution across the terrain of the map. Team members distribute quickly across the terrain into appropriate locations, and rapidly re-distribute as their side and the enemy perish. Re-distribution can also take place when a team member newly occupies a location that might be particularly desirable for a certain activity, such as a sniping spot. Co-players may find such a point along their traversed route 'occupied' by co-players and thus 'taken care of already' for that player's team. In this instance, the player is competently ensuring the ramp area is 'clear' for most of the round, enabling co-players to concentrate on other, more problematic areas. As part of identifying where problematic 'undersubscribed' areas, co-players have to decide whether to re-distribute to these locations—which has implications for their equipment choices (e.g., find another sniper spot, or 'make do' with just a handgun) —or hold back and wait for the occupying team member to require help. The strategies for this specific round draw on both immediately available resources and historical experience of previous rounds.

Play on the map begins with the player starting at a certain 'spawn' point[2], which in this vignette is a sheltered area with two possible routes, one leading directly to the top of the ramp. The player's choice of route at the very beginning of the round, for example, draws strongly on the observed orientation of co-players' avatars and the direction they are traveling in at this critical time. For the relatively experienced player, likely to be a leader at the outset, the ramp is known as one of the core 'flashpoints' for play in this terrain, and lends itself to a multiplicity of strategies (in a reflexive relationship with the opposing team) though most frequently these surround sniping at one another. As discussed for strategies, spawn points and the beginnings of the round configure play to proceed in particular ways, and so establish the commonly used routes and loci (as the historical experience of each player) that directly influence the emergence of flashpoints between the teams.

However, the flashpoint here also involves a spatial arrangement of lines of sight for one team's sniper positions at the ramp's top, coupled with the bottom of the ramp being a major route for the other. As we observed earlier, flashpoints are where the map's elements are spatially arranged in such a way that players are forced to navigate through a dangerous confined area, such as between the crates cluttering the first vignette's narrow corridor. Nevertheless, due to the rapid nature of a CS round, there is a highly contingent temporal aspect of maps in terms of how long it takes to traverse certain routes from the spawn points. Some areas on maps are quite remote, and only come into play in later stages of a particular round.

Flashpoints, in summary, are a phenomena generated from the moment-by-moment, reflexive, ongoing and strategic interaction between players, the trajectory of that play as a sequence of rounds, from the spatial configuration of the map, and the temporal implications of this configuration.

Terrain. The concept of 'terrain' integrates and brings together the features outlined in discussion of strategy and flashpoints, of which we can now develop a deeper understanding. As we have noted, the expert player will be aware that, on this map, team mates can be anticipated to stand at the top of the ramp, sniping, creating a dangerous zone for approaching enemies as they ascend the other end of the ramp. The player's understanding of, and conduct in the terrain local to the ramp, is shaped by his or her historical experience of that locale, as well as his or her ongoing experience with it in a dynamic relationship to the tactics of the opposing team. Whilst we have only been able to explore one particular round of sniping on the ramp, there is a sense in which the virtual environment of the ramp and its two ends commences its existence as a 'flat' space of possible player action (a 'flat' terrain), and is then subsequently shaped into a lived terrain as play happens over the course of seconds, minutes and hours. This shaping of the player's experience is an understanding of the basic

elements we have presented above: the historical view of player conduct in a particular location, and likely zones of engagement in the map in that place. Knowing and becoming competent within this complex terrain is one of the central skills for the CS player to cultivate.

Even a short-term historical view of play, in terms of a series of such rounds, is not enough to be a good player; our player here knows already the benefits of being at the top of the ramp with the sniper rifle before. Experienced players have had a long-term engagement with the game (e.g., they have a lengthy session of play several times a week, perhaps for several years). Getting to grips with a terrain is echoed by descriptions of runners' experiences in the 'Can You See Me Now' game (Crabtree et al., 2004a) where members of the game (performers) situated on-the-streets came to develop a 'stock of knowledge' and body of experience about the terrain of city streets as a relationship between what the map presented and how GPS coverage performed.

The stable and unchanging physical layout of the '`de_dust`' map presented in the vignette is also an important feature in making the map a lived (and liveable) terrain, and a viable arena for the development of skill within that terrain. Consider how much less compelling a game of chess would be if the shape of the board changed each game. The stability of the ramp's location, contents and the surrounding virtual objects that lead up to it, coupled with fact that players will continually play this map over and over again, provides more than a static background for the development of skill, it enables the player to see prospective possibilities and projected courses of action in the contingencies of each particular game (Livingstone, 2006). The map is not a set of coordinates, but is rather a series of places, which the significance of, at any particular point in any particular game, is highly contingent to the current state of play. Again, in comparison to chess, the meaning of each square

depends on the state of play, even though parts of a board have some stable characteristics over different games.

Finally we return to Sudnow's experience of the temporal and spatial features of skill. Sudnow describes a similar phenomenon for the development of skill in improvisational piano play (2001). Players learn that as they get to particular parts of improvised music, certain routes are open to them in which they can still play musically. Indeed, being a good improvisational piano player involves knowing how to get to 'good' points in music (rich in possibilities) and avoid points where the improvisation might turn less musical. As Sudnow describes it, to a good improvisational jazz player, the piano presents something of a landscape of directions in which one can take play, with difficult hills, smooth fast valleys and the like. Playing music is navigation involving the player's knowledge of where to go and when. In a similar way the terrain for an expert CS player goes far beyond 'knowing where things are on the map'—the player knows what parts of a map mean for that particular point in play. Good players know where to go and how on the map to win, their knowledge of the map is tied up with their navigation of the map. In doing so they show a similar learning and navigational skill to piano play as described by Sudnow.

Conclusion: Understanding expertise

Our two vignettes have hopefully exhibited something of the skilled play of CS and why these games are so compelling. The vignettes show how players need to combine a close eye on the current proceedings with a complex and developed sense of what others—friend and foe—are doing in the environment; where others usually, and actually are, what they are usually and actually doing and what they can see of the other players. This sense involves many gradually developed competence, such as an appreciation of both the immediate and

historical features of the terrain players are navigating, a rapid appraisal of reciprocal viewpoints, reacting and adapting quickly to the tactics of the opposition, and so on.

Whilst we have developed our study inspired in particular from exemplary work by Sudnow, it is worth noting the significant differences that help extend his work. Sudnow's Breakout was in essence a solitary pursuit, and whilst the sociality of the game is hinted at (his first encounter with the game is at a party), it is not explored in depth, and Sudnow's analysis is limited to lonely sessions of gameplay. Counter-Strike, on the other hand, draws its success largely from being a game play with and against others, its support of varying levels of collaboration, and strong support for the social demonstration of skill. Our paper has been concerned firstly with understanding what the nature of that skill in a particular game is, what the nature of collaboration in CS is and how players learn from the tactics of others as opponents and team members.

Competence in CS begins with moving beyond single movements into the fluid sequencing of actions (in contrast to behaviourist notions of chaining, however in consonance with cognitive science's observation of experts' global approach to problems (Chi, Feltovich and Glaser, 1981)). Expertise is choreographing conduct such that individual parts are not the focus, but rather the symphony of combined complex activity in a terrain of developing, emergent tactics. In situ, experts see their activities as gestalts —not as individual actions but holistically as 'whatever they are doing.' So, in an example from CS, not 'ducking and then running,' but 'avoiding a flashpoint.'

Thus, we generally recommend against breaking down expert activity into smaller parts for this specifically loses experts' phenomena or indeed the phenomenon of expertise . Seeing deft gameplay only as individual steps "systematically filter[s] out precisely the particularity of details that characterizes situated actions" (Suchman, 1987). Game expertise needs to be

studied and conceived of as lived play which is constantly concerned with ‘why that now’, ‘where can I go from here’, ‘what next’ and other familiar concerns from those who study the sequential ordering of human action. Sudnow’s notion of ‘terrain’ captures expertise in terms of this rapid judgement of what to do next in terms of an emergent spatialised grasp of the game, seeing the implications of actions in a particular environment, at a point in time, whch open up where a player of my competence can go. To Sudnow, this hard won sensing of potential ways ahead from this location in the game is ‘understanding the terrain.’ For the CS players this went beyond simply knowing the maps they played, to knowing what relevance those map features had for their play at particular points in time.

Sudnow’s concept of terrain, then, captures expertise as finding a way toward what to do next, seeing the implications for those actions in this environment, at this point in the course of play of the game and sensing where can be gotten to from here. Our CS players became experts in large part through differentiating repetition, trying out small variations on the ‘same’ response to the enemy, the ‘same’ probing and the use of the ‘same’ weapon. As in chess, every CS game is different precisely because players, in their continual appraisal of their experiences, see each game relative to previous games. Indeed, FPSes are distinctive from most other virtual environments in how quickly the success or otherwise of actions is made apparent and how repetition (with subtle changes) is part of the game. One’s mistakes, rather than being hidden, are made public and in a sense automatically analysed through the sudden jump to the view of the enemy killed (or perhaps lucky) enough to hit you.

Although environments such as those found in CS are three-dimensionally complex and visually rich, their real complexity is in the play of the game with others, with team members and wily opponents. With more ‘intellectual’ games such as chess and Go, the rules are quite straightforward and yet the permutations of strategy and counter-strategy are endless, as perhaps evidenced by the large amounts of scrutiny such games have been subject to.

Counter-Strike is in many ways no different. As we have shown, the simulated 3D word of CS is also a rich interactive temporal environment (or 'terrain' as we have termed it following Sudnow), in which a large field of possibilities and potentials are realised as actions within a terrain of continually unfolding events.

Finally, our analysis of CS has been concerned with the very practical details of the player experience and how the game mechanic works out between players. We also noted in the introduction that the relatively overlooked nature of this topic motivated our study. However, CS is but one game in one particular genre amongst many other highly popular online games, and it remains to be seen whether the features we have identified in this paper are unique to the setting and structure of play in CS, how they might be applied across other FPSes, and perhaps even other genres, such as massively-multiplayer online (MMO) games. As such we would recommend our approach to other researchers when addressing other games, order to move beyond observations *around* play, and begin to uncover the ways in which expertise *in play* is developed in these varied and different environments.

References

Atkinson, J. M. (1984). Public speaking and audience response: Some techniques for inviting applause. In Structures of Social Action, Atkinson, J. M.; Heritage, J. (eds.) Cambridge: Cambridge University Press, 370-409.

Beach, W. A. and LeBaron, C. D. (2002). Body Disclosures: Attending to Personal Problems and Reported Sexual Abuse During a Medical Encounter Journal of Communication 52 (3), 617–639.

Brown, B. and Bell, M. (2004). CSCW at play: there as a collaborative virtual environment. In proc. of CSCW, Chicago, IL., ACM Press, New York, pp. 350-359.

Button, G. (Ed.). (1993). Technology in working order: studies of work, interaction and technology. London: Routledge.

Castronova, E. (2005). Synthetic Worlds : The Business and Culture of Online Games, University Of Chicago Press

Chase, W.G. and Simon, H.A. (1973). Perception in chess. Cognitive Psychology, pp. 55-81.

Chi, M. T. H., Feltovich, P. J. and Glaser, R. (1981). Categorization and representation of physics problems by experts and novices. Cognitive Science, 5, 121-152.

Clancey, W. J. (2006). Observation of work practices in natural settings. in K. A. Ericsson, N.C., P. J. Feltovich, and R. R. Hoffman ed. The Cambridge Handbook of Expertise and Expert Performance, 127-145.

Crabtree, A., Benford, S., Rodden, T., Greenhalgh, C., Flintham, M., Anastasi, R. et al. (2004a) “Orchestrating a mixed reality game ‘on the ground’”, Proceedings of the 2004

CHI Conference on Human Factors in Computing Systems, pp. 391-398, Vienna: ACM.

Crabtree, A. (2004b). Design in the absence of practice: breaching experiments. In proc. of DIS, pp. 59-68, Cambridge, Massachusetts: ACM.

Crabtree, A., Benford, S., Capra, M., Flintham, M., Drozd, A., Tandavanitj, N. et al. (2007). The cooperative work of gaming: orchestrating a mobile SMS game. Computer Supported Cooperative Work: The Journal of Collaborative Computing (JCSCW). Special Issue on Leisure Technologies.

Dourish, P. (2002). Where the action is: foundations of embodied interaction. MIT Press, Cambridge.

Dreyfus, H.L. (2002). A Phenomenology of Skill Acquisition as the basis for a Merleau-Pontian Non-representationalist Cognitive Science. In Proc. of the Int. Conf. Foundations and the Ontological Quest. Rome, Vatican City.

Ducheneaut, N. and Moore, R.J. (2004). The social side of gaming: a study of interaction patterns in a massively multiplayer online game. In proc. of CSCW, ACM Press, Chicago, Illinois, USA.

Ericsson, K.A., Charness, N., Feltovich, P.J. and Hoffman, R.R. (2006). The Cambridge Handbook of Expertise and Expert Performance. Cambridge University Press, Cambridge, 2006.

Ericsson, K.A., Krampe, R.T. and Tesch-Roemer, C. (1993). The role of deliberate practice in the acquisition of expert performance. Psychological Review, 100, pp. 363-406.

Garfinkel, H. (2002). Ethnomethodology's Program, Working Out Durkheim's Aphorism. New York: Rowman & Littlefield Publishers.

Garfinkel, H., & Sacks, H. (1986). On Formal Structures of Practical Actions. In H. Garfinkel (Ed.), Ethnomethodological Studies of Work (pp. 160-193). London: Routledge and Keegan Paul.

Goodwin, C. (2000). Practices of Seeing, Visual Analysis: An Ethnomethodological Approach. In C. Jewitt & T. V. Leeuwen (Eds.), Handbook of Visual Analysis (pp. 157-182). London: Sage.

Harper, D. (1987). Working knowledge: skill and community in small shop. University of California Press, London.

Heath, C. and Luff, P. (2000). Technology in action. Cambridge university press, Cambridge.

Hutchins, E. (1995). Cognition in the wild. London: MIT Press.

Ingold, T. (2006). Walking the plank: meditations on a process of skill. In Dakers, J.R. (ed.), Defining technological literacy: towards an epistemological framework. Palgrave Macmillan, New York.

Laurier, E., & Philo, C. (2004). Ethno-archaeology and Undefined Investigations. Environment & Planning : A, 36, 421-436.

Laurier, E., Whyte, A., & Buckner, K. (2001). An ethnography of a cafe : informality, table arrangements and background noise. Journal of Mundane Behaviour, 2(2), http://mundanebehavior.org/issues/v2n2/laurier.htm (verified 03/12/07).

Lave, J., & Wenger, E. (1991). Situated Learning: Legitimate Peripheral Participation (Learning in Doing: Social, Cognitive & Computational Perspectives S.) (Paperback) by Jean Lave, Etienne Wenger. Cambridge: Cambridge University Press.

Lee, J. R. E., & Watson, D. R. (Eds.). (1993). Interaction in Urban Public Space, Final Report - Plan Urbain. Manchester: Dept. of Sociology, University of Manchester.

Livingston, E. (2006). Ethnomethodological studies of mediated interaction and mundane expertise, The Sociological Review, 54, 3, 405-477.

Manninen, T. and Kujanpää, T. (2005). The Hunt for Collaborative War Gaming - CASE: Battlefield 1942. In Game Studies, 5(1), October. http://www.gamestudies.org/0501/manninen_kujanpaa (verified 03/12/07).

McHugh, P., Raffel, S., Foss, D. C., & Blum, A. F. (1974). On the Beginning of Social Inquiry. London: Routledge & Kegan Paul.

Moore, R. J., Ducheneaut, N., and Nickell, E. (2006). Doing Virtually Nothing: Awareness and Accountability in Massively Multiplayer Online Worlds. To appear in: Journal of Computer Supported Cooperative Work.

Muramatsu, J. and Ackerman, M. S. (1998). Computing, Social Activity, and Entertainment: A Field Study of a Game MUD. JCSCW, 7 (1-2), pp. 87-122.

Nardi, B. and Harris, J. (2006). Strangers and friends: Collaborative play in World of Warcraft. In proc. of CSCW, ACM Press.

Orr, J.E. (1996). Talking about machines: An ethnography of a modern job. ILR Press, Ithaca, N.Y.

Proffitt, J.B., Coley, J.D. and Medin, D.L. (2000). Expertise and category-based induction. Journal of Experimental Psychology: Learning, Memory & Cognition, 26(4), pp. 811-828.

Ryave, A. L., & Schenkein, J. N. (1974). Notes on the Art of Walking. In R. Turner (Ed.), Ethnomethodology (pp. 265-274). Harmondsworth: Penguin.

Sacks, H. (1972). Notes on Police Assessment of Moral Character. In D. Sudnow (Ed.), Studies in Social Interaction (pp. 280-293). Glencoe: Free Press.

Sacks, H. (1992). Lectures on Conversation. Jefferson, G. (Ed.), Blackwell, Oxford.

Sacks, H., Schegloff, E. A., and Jefferson, G. (1974). A simplest systematics for the organization of turn-taking for conversation. Language, 50, 696-735.

Salen, K. and Zimmerman, E. (2004). Rules of play: game design fundamentals. MIT Press, Cambridge.

Suchman, L. (1987). Plans and situated actions: The problem of human-machine communication. Cambridge University Press, Cambridge.

Sudnow, D. (1984). Pilgrim in the Microworld. Warner Books.

Sudnow, D. (2001). Ways of the hand: a rewritten account. MIT Press, Cambridge, Mass..

Sweller, J. (1994). Cognitive load during problem solving: Effects on learning. Cognitive Science, 12, pp. 257-285.

Wenger, E. (1998). Communities of Practice, Learning, Meaning & Identity. Cambridge: Cambridge University Press.

Wright, T., Boria, E. and Breidenbach, P. (2002). Creative Player Actions in FPS Online Computer games—Playing Counter-Strike. In Game Studies, 2(2), December. http://www.gamestudies.org/0202/wright (verified 03/12/07).

Yee, N. (2002). Ariadne—Understanding MMORPG Addiction, October. http://www.nickyee.com/hub/addiction/home.html (verified 03/12/07).

Yee, N. (2001). The Norrathian Scrolls: A Study of EverQuest. http://www.nickyee.com/eqt/report.html (verified 03/12/07).

Figures

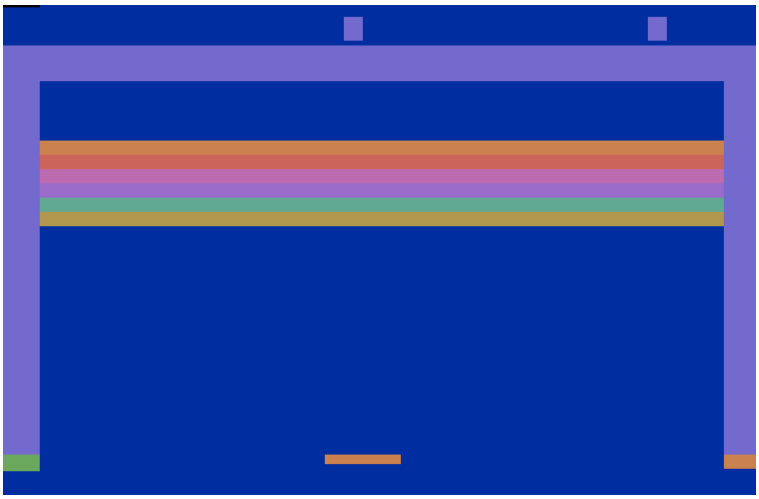

Figure 1. A screenshot of Breakout

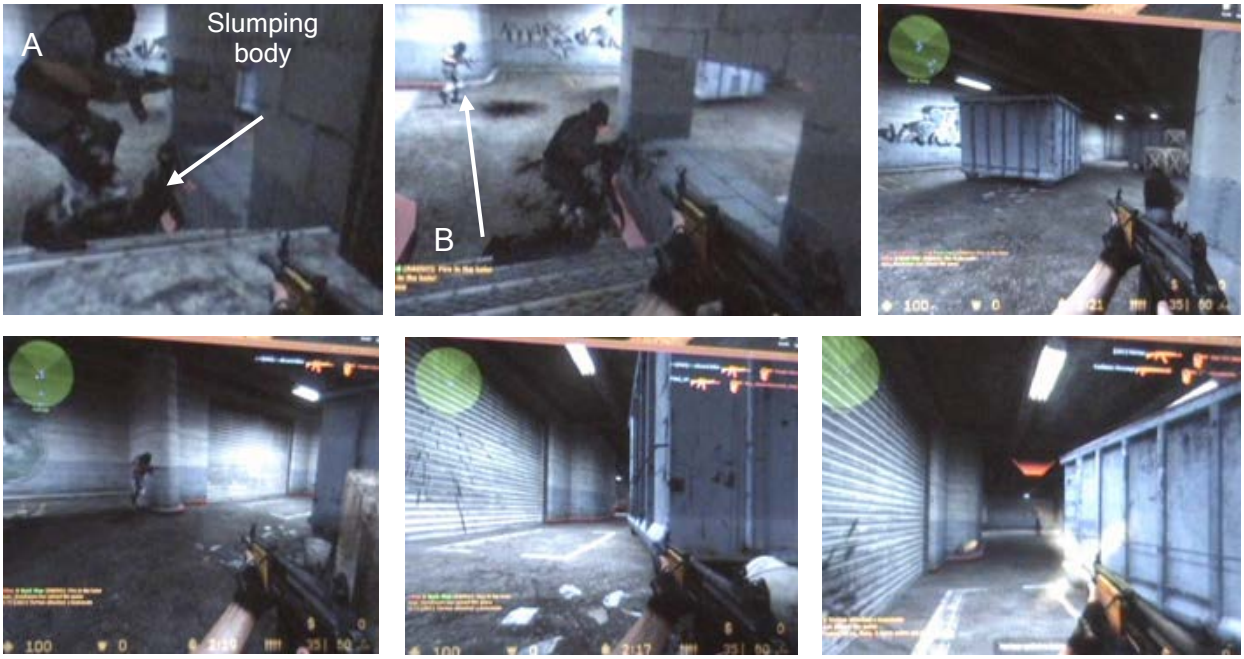

Figure 2. Down the stairs with co-players A and B (top left and middle). Getting closer to the container (top right), glancing at co-player B (bottom left). Entering the danger zone (bottom middle), spotting the enemy (bottom right).

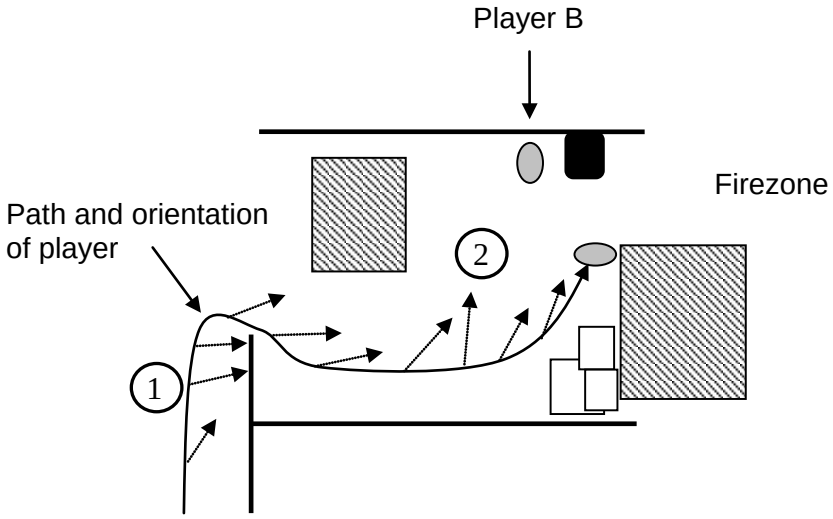

Figure 3. Player movement path for `cs_office`.

Figure 4. 'Terrorist' (left) and 'counter-terrorist' (right) models.

Figure 5. Sniping on the ramp, with co-player A visible (noticeable on top left and bottom images).

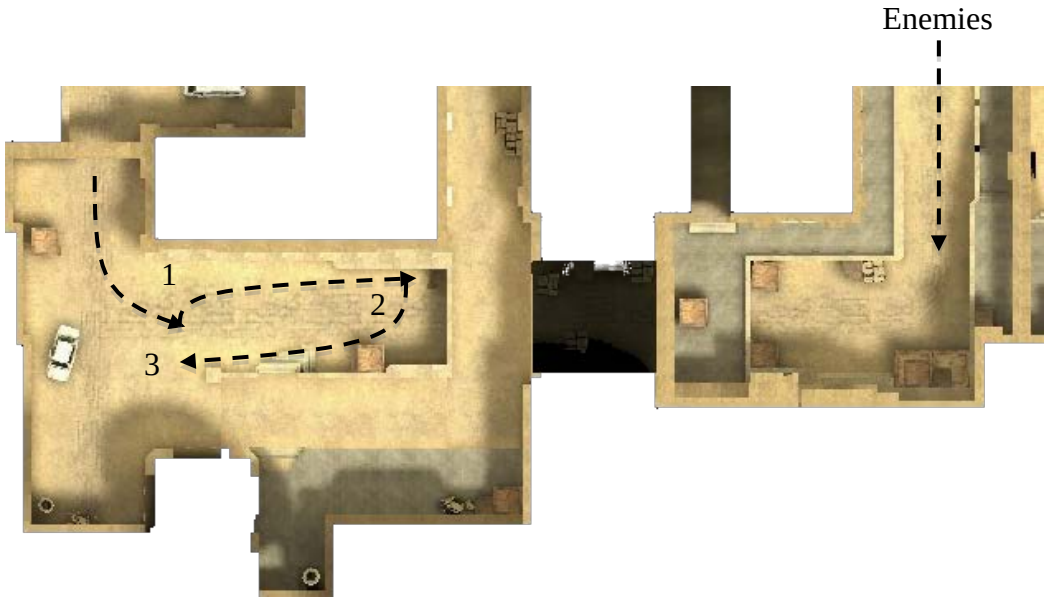

Figure 6. Player movement path (1-3) for `de_dust`.

Footnotes

1. We note that the vast majority of play is performed online, with players connecting to remote game servers that act as secure, authoritative hubs for the play.

2. The exact location of these spawn points depends upon the map that is currently being used.

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