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Games as Actors - Interaction, Play, Design, and Actor Network Theory

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Abstract—**When interacting with computer games, users are forced to follow the rules of the game in return for the excitement, joy, fun, or other pursued experiences. In this paper, we investigate how games achieve these experiences in the perspective of Actor Network Theory (ANT). Based on a qualitative data from a study of board games, computer games, and exergames, we conclude that games are actors that produce experiences by exercising power over the user's abilities, for example their cognitive functions. Games are designed to take advantage of the characteristics of the human players, and by doing so they create in humans what in modern play theory is known as a "state of play".**

Keywords: computer games; board games; Actor Network Theory; interaction; game research; game design; play theory

I.   INTRODUCTION

Using computer software usually implies that the user is the active part who controls the interaction by input and direct manipulation [1] [2]. Interaction with computer games is a different experience because the user acts in a game world where the contents of the game has extensive influence on the gamer's behavior. Game figures and other game items are not just passive objects that can be manipulated by the gamer. For a game to come live, gamers have to follow rules and act as the game requires. Playing a computer game like *Counter Strike* [3] or *World of Warcraft* [4] is not just a question of manipulating an avatar. The game is forcing the gamer to react to events in the game by acting in a certain way if he wants to survive and prosper in the game, i.e., the gamer is placed in a role he has to fulfill. In other words: games do something to and with people who play them and, in a certain way, games are just like actors who have an agency. What this agency consists of and how it is engineered is of interest to designers.

In this article, we will demonstrate how games can be seen as actors and as organizers of actors and actions on the basis of Actor Network Theory (abbreviated to "ANT") [5]. ANT is well suited for the analysis of interaction with games by users since ANT offers an approach to agency that does not assign power only to human actors but allows the possibility for objects and rules to be examined as actors. Also, ANT opens the door to viewing design as a social enterprise. As Yaneva stresses: "…design has a social goal and mobilizes social means to achieve it" [6].

ANT has received some attention in game studies during the last decade. Several scholars have studied games on the basis of ANT [7], focusing primarily on the interchange between humans and technology [8] or on the development of social networks in online games [10]. We take a different approach and show how the ANT perspective can explain which forces are at work when games are actually played. Our focus is thus on defining the immediate effects of using games. Our approach is in line with Seth Giddings [9], who have analysed games from the perspective of ANT. Giddings stresses that "the analysis of video games […] demands the description of a special category of nonhumans, software entities ([…] agents] that act more or less autonomously or effect emergent behaviour" [9].

The article is the result of a research project where we studied gamers of different ages playing computer games, board games, and digital play equipment. Contrary to Giddings and other scholars studying computer games, our point of departure was the theory that computer games and other games based on digital technology are games before they are anything else [10]. They are not first and foremost technology. Therefore, the study is focused on studying games as a genre rather than just digital games, and our main example here is a board game.

In the next section, we will introduce ANT focusing mainly on the concept of "translation" which is employed as our main analytical foundation. After this, the paper will present the research methodology applied for collecting data. In the following sections, the selected case of game playing will be presented followed by a presentation and a discussion of the results of our investigation. In this section, we will also draw on modern play theory to further explain how and why games function and also why computer games belong to the general genre of games. We conclude this article with reflections on how our viewpoint influences design.

II.   ACTOR NETWORK THEORY

ANT was first developed by science and technology study scholars Michael Callon and Bruno Latour [11] as a new approach to social theory. ANT is of interest to any analysis of technology which goes beyond the assumption that technology is a mere instrument that we, as humans, utilize. ANT claims that any element of the material and social world (nature, technology, and social rules) can be an

actor in the same way humans are. Agency is never only human or social but always a combination of human, social, and technology elements [12]-[14].

ANT is not a theory in the usual sense of the word according to Latour himself, since ANT does not explain "why" a network takes a certain form or "how" this happens [5]. ANT is more a method of how to explore and describe relations in a pragmatic manner, a "how-tobook" as Latour defines it [5], and, as such, it offers a way to describe ties and forces within a network.

The main idea of ANT is that actions always take place in interaction between actors in networks when actors influence each other and struggle for power. We usually see social interaction between humans this way, however, ANT differs from traditional social theory by stating that the actors are not only humans but can be other elements as well.

A. The traffic example

ANT can be difficult to grasp and even counter-intuitive [12] because it reverses our common understanding of actors and agency, e.g., when it cuts across the subject-object division underlying our thinking about the world we live in. In an attempt to clarify ANT, Hanseth and Monteiro [15] use traffic as an example to explain the implications of seeing something in the perspective of ANT. We find their example very useful in obtaining a better understanding of ANT and, hopefully, what we later have to say about what games do. The following is a short presentation of their attempt and afterwards we will use it to explain the process of translation: When you are driving in your car from one place to another, you are acting, however, your acts are heavily influenced by technology, the material world (maneuvering abilities of the car, layout of roads, traffic signs, traffic regulation, etc.), and the immaterial (traffic rules, traffic culture, etc.) and habits (your own behaviour as a driver) [15].

According to ANT, these factors (including you) all function as actors and should be understood as forces of agency in a linked network. If you want to play the game, human and non-human, technical and non-technical elements are part of the network, and none of the elements are per definition granted special power over the others [12], [15].

Expanding the thoughts of Hanseth and Monteiro, we can add that, in the traffic example, you want to move from place to place, but you are dependent upon technology and forced to act in accordance with both social rules and physical conditions. Even though you are the driver, you will clearly feel the forces of other actors when acting out the driving. For instance, the road forces you to follow a certain route, the traffic light forces you to stop and start. One can say that in order to reach your goal safely and quickly, you have to "give in" to the network and in a way "hand over" your acting power and control over the car, so that the vehicle will move in accordance with the demands of traffic network. You have to "delegate" [12] power to the traffic network, and, in return, you will reach your goal as fast and safely as possible. Of course, you are not handing over the control of yourself to the network. To delegate is more to act as prescribed by other actors. According to ANT, this is what happens in an actor-network relation.

B. Translation

The way delegation is done is through the process of *translation*. This process requires the actors in a network to accept roles, a worldview, rules of acting, a path to follow etc. Michel Callon [16] describes the process of translation as a process of "persuading" with four distinct phases, he calls "moments": problematization, interessement, enrolment, and mobilization. These moments are inter-related overlapping steps that describe how stable actor-networks come to be established [17]. We will introduce them briefly in the following, and later use them in our game analysis.

The first moment, problematization, is where some of the actors in the network in question bring forth a definition of the problem and present a viable solution to it for the other actors. This is also the process during which the actors' roles are defined (both human and non-human actors). To use the , example above, this is where the car and the traffic network are presented as a solution to the transport problem.

As part of the problematization process, a so-called obligatory passage point (OPP) is defined, i.e., a practicable solution, which the actors have to accept to achieve their goal. An OPP "is viewed as the solution to a problem in terms of the resources available to the actant [actor] that proposes it as the OPP (…) It controls the resources needed to achieve the actant's outcome." [18] By defining an OPP, other possibilities are closed [16]. In the traffic example, the OPP is literally a passage, since it's the roads and the current traffic rules, etc., which have been established as a solid, reliable network.

The second moment, interessement, is where the main objective is to convince all the involved actors that the proposed problem and solution is the correct one so that they will accept to use this solution and not another one. In the traffic network, this is done by the use of sanctions from traffic rules, signs, and, not least, by the learning processes human actors go through to get a driver's license.

When the interessement of the actors is successful, the third moment, enrollment, is happening. This moment is important since it is here that support and allies are created, and the process by which actors become part of a network. The process can happen in many ways: "To describe enrollment is […] to describe the multilateral negotiations, trials of strength and tricks that accompany the interessements and enable them to succeed." [16]. In relation to the traffic network, one can think of all the things that support cars and their moving along the roads.

Finally, the last moment, mobilization, is where the actors are mobilized in such a way that they act in accordance with their prescribed roles and thereby maintain the established network. This happens when the drivers drive their cars following the rules and pathways of the traffic network.

C. Design as inscription

The effect of translation is delegation of power and agency. In relation to design of objects, e.g., computer games, translation is about how to construct an object in such a way that users are convinced to delegate agency. This is

described as *inscription* and *description* by Madeleine Akrich [19].

Inscription is the process where a designer embeds a special way the user has to interact with the designed object. The designer is envisaging a user and a use case for the object and develops an intended use, which is inscribed into the object by use of, for instance, physical shape, GUI, behavior of objects, and affordances in general.

Akrich compares inscription with a movie script and calls the result a script for how the user should use the object. We see this in the design of e.g. the user interface of an iPad, where users are compelled to use finger movements to interact which are a more intuitive way of interacting and quite different from using a computer mouse.

While inscription is the designer's idea and framing of the interaction, Akrich uses the term description to describe the actual usage of the objects. This is where the script, built into and drawn upon in the design process, meets the user in an actual user setting. Coming alive is the central part of description. It is central to ANT that a non-human actor can have agency and perform actions and this is what we see when scripts, embedded in designed objects, come to life and objects engage in a network with other actors.

In the perspective of ANT, a game can be studied as a designed object with inscriptions that has agency and does something with the user, because the user invokes a network of actors and agency when he starts playing a game, i.e., following the rules of the "game world". A game designer has to be aware of the network of actors that the specific game design can invoke if he wants to be able to use it in the process of inscription. Networks of actors represent the unit of analysis in our study presented below.

III. RESEARCH METHODOLOGY

Our research method relied on qualitative data collected through observation, based on non-participatory observation as well as active participation and interviews [20], [21].We collected data from 12 game sessions during which we observed informants, recorded their behavior and interviewed them before, during, and after playing. To ensure recordable data, we used games in which players had to be social and communicate with one another and board games was particularly well suited for this since people tend to talk more when playing such games. We observed children as well as grown-ups and mixed age groups playing games in natural settings at home in a family situation or with friends.We recorded spoken language as well as body language and managed the many data using thematic and theoretical coding as described by Uwe Flick [22], who is inspired by Grounded Theory [23]. The analysis of the collected data was of course done using ANT. Researchers from social science have demonstrated that ANT is well suited for exploratory research in areas that have not been investigated much, not least because ANT-driven research is often able to draw up new conclusions [17], [24], [25]. The purpose of our study was to investigate and describe agency and actors at work when gamers play games. As our framework of analysis, we employed the concept of actors and agency and the four described moments of translation,

being careful not to differentiate between non-human and human actors. We analyzed agency by following what people did with games, extracting actors and ties, and described the translation process in the actual game situations, as we will demonstrate in the next two sections. These sections are also reports of "findings" from our study. As Kraal [17] writes with reference to one of the founding fathers of ANT alongside Latour, John Law: "It is the nature of ANT that it is easier to describe through a demonstration of its use".

It is important to mention that the object of our study is not the games themselves, but the *event* that unfolds when games are played [9]. In accordance with ANT, we analyse games in action when the forces of the network are at work, so to speak.

IV. CASE: THE GAME "QUACKLE"

The case of playing the board game "Quackle" in a mixed age group is used as an example for our observations in general and in the following, we will use our analysis of this case to present our interpretation of what the game actually does.

D. Quackle! The game

The game, which was awarded "Game of the Year" in Denmark in 2006, is a typical funny board game for humans aged 5 and above. In short, the game consists of 12 different animal figures, 8 barns, and 97 playing cards with pictures of the animals and one arrow card (see Figure 1). The game starts with each player pulling an animal figure from a cloth bag showing it to the others and then hiding it in his barn so the others can no longer see it. The cards are dealt and placed in a pile in front of each player face down.

Figure 1. Photo of the game Quackle! with animals, cards, and barns on the left.

The objective of the game is to get rid of all the cards you have in your pile. Each round of the game consists of the players in turn turning a card and placing it for all to see. If two players have the same animal on their card they enter a *battle* during which the players compete on being the first to loudly say the sound of the *other* player's animal hidden in the barn. The player who looses the battle must pick his own and the pile of upwards facing cards of his opponent. The game continues until once again there are two identical animals in the cards or one of the players gets rid of all his cards [25].

The game seems pretty simple, but requires that the

players can remember and quickly mobilize the correct sounds when two identical cards are turned, which is more difficult than one might think, even for adults.

E. Game inscription

As we see in the above description of the game, there is a special way players are expected to interact with the game (the inscription) and, as we will argue in the following, in this way the game uses the learned scripts that the player brings along as well as physical and psychological abilities of the player. Among other things, the game takes advantage of the knowledge of the players (i.e., scripts) about animals and animal sounds, and the game utilizes the fact that most humans have a tendency to react automatically in pressurized situations. It is precisely this automatic reaction that makes the game funny, because the players make lots of mistakes trying to be the fastest which often result in weird sounds that is a mix between different animal sounds.

The game designer has created an inscription that can be indicated as follows: We must say a particular animal sound while we see and try to remember a lot of other animals. These many inputs are combined with the stress factor that the game introduces by stating we must respond faster than our opponents! Thus, the inscription creates a special way the player has to act, i.e., a specific way the players have to use their abilities.

In the perspective of agency, it is noteworthy that the game forces the player to make mistakes and thereby produce a mishmash of sounds which he would not normally produce. When asking our informants about the experience, most of them said their tongue was "out of control". In this sense, it is evident that the game has agency and does something to the player.

F. Translation

The inscription plays an important role when considering the whole situation as a translation. As previously described, the translation consists of four moments which we will now outline in relation to the game scenario.

The first moment is the problematization, which is where we are presented with a problem. In our case, the game is played in natural situations on a Friday evening in a family of four (parents and two children, son aged 12 and daughter 21). For the family, the problem is the need for entertainment understood as a peaceful and enjoyable social time together. In this case, the game of Quackle is set up as a solution. Like any family game and most entertainment products, it promises that playing the game will lead to the experience of fun. Thus, the game is put forward as an actor who can do a piece of work (give us fun) through the way other actors treat it. This happens when one of the family members says, "Let's play Quackle, its fun. We always laugh so much when we play it" (quote from the daughter in this case).

The game is put forward as a solution and as the obligatory passage point (OPP) to social entertainment. The solution simultaneously suggests roles and organizes relations, i.e., a specific network where the family members will become game players and the living room table and chairs to facilitate the family sitting together. No less important is it that the game will establish equality between the players regardless of age and family position.

In the next moment, the interessement, which actually takes place in parallel with the problematization, the family members are convinced the proposed solution is the right one and barriers for alternative solutions to the problem are added. One of the things that are cut off is television; a frequently used source of entertainment in the family, when one of the adults says: "We shouldn't watch television, we always do. We should do something together instead." (quote from the episode).

Enrollment is the third moment where the players are enrolled and this entails that they must accept the roles of participants as players of Quackle and accept the terms of the game.

In the last moment of translation, mobilization, the solution is executed when the family members sit down with the game and start playing. If the mobilization works and the translation process is thus successful, it enables the family to experience fun and laugh together. This is exactly what happened to the test family via the interaction with the game, which created a lot of laughing especially when the parents made weird sounds.

In our observations, we also encountered an event of a failed translation. In this episode, which involved four adults and two children, the setup was similar to the above but the one of the players did not accept the role of a player who could end up saying a wrong sound, and thus she ended up destroying the game. She did not hand over agency to the game and did not act as prescribed by the game.

This episode was special, but its points to the fact that the translation can fail and the players have a choice, though this choice comes with certain consequences (they never got in to play).

Going back to the situation with the successful translation, the game re-organizes the social connections within the family and in so doing builds a new network of actors and agency. The game is what Latour has named a "mediator" that "transforms, translates, distorts, and modifies" relations [12]. But the game does more than alter the social relations. It mediates the body and mind of the individual players. In the following, we will address how Quackle accomplishes the mobilization of the physical and cognitive abilities of the players.

V. WHAT THE GAME DOES

A game cannot do much by itself but is dependent on other actors, and this is, of course, particularly true for board games. Nevertheless, games have agency that makes game players act in a manner they would not have acted without the game. In that sense, the game "does" something in line with Latour's concise statement on what defines an actor: "anything that does modify a state of affairs by making a difference is an actor [...]" [5].

Latour stresses that when we are studying a network in ANT, we are focusing on the circulation between the connections that make up the network [17]. When we look into the Quackle game, we are looking at how agency is floating between the involved actors, the details of which we

will try to demonstrate through an analysis of a play scenario.

First, the scenario of a family playing the game:

1)   The game is placed on the table and the players sit down around it.

2)   The game is opened, and the game elements are displayed. There are animals, barns, and cards and a cloth bag.

3)   The animals are hidden in a cloth bag and all players get a barn.

4)   Each player pulls an animal from the cloth bag: Player 1 gets a snake, player 2 a dog, player 3 a donkey and player 4 a frog.

5)   After all animals and sounds have been introduced, they are stored out of view in the barns.

6)   The cards are shuffled and dealt.

7)   Everyone is ready and turn their first card.

8)   A horse, a cow, a duck and a pig is turned, so there is no match.

9)   Next cards are turned: a snake, a pig, a frog and an owl appears, still no match.

10) The third cards are turned: A mouse, a donkey, a rooster and an owl appear.

11) The game gathers speed and the cards are turned a bit faster.

12) The fourth card is turned: a cat, a dog, a cat and a frog.

13) Player 1 shouts "Qu..iau" [sounds a combination of a frog sound and a cat sound] and player 3 "Vu..sh"[a combination of dog sound and snake sound] followed by a grinning "Oh no, uh" and finally player 1 says "Miau" just before player 3 says "Sssshh".

14) Player 3 must gather player 1's card and the game continues.

This is the basic structure of the game which continues in a similar manner for a long time (about 30 minutes) before a player wins.

Points 1 and 2 are of practical character, but they help to create the framework for what is going to happen. Thus, the following activities are framed and the game's inscription starts to become clear, especially in the form of the rules. The agency is still with the players. This is also the case in point 3, but here the game starts to gain agency. It starts to have an effect on the players, as it prescribes their actions in the next steps.

Our observations show that, at the same time the players build up anticipation about what is going to happen which is seen by the body movements and heard by the tone and pitch of voices, this anticipation started when the players accepted the game as an OPP. It was especially noticeable in points 4 and 5, where the joy of hiding the animals in the cloth bag and pulling one provides a form of excitement that is particularly evident in the youngest child. Thus, we see here that the agency is distributed to the game as a kind of pre-disposition of body and mind [6].

In point 5, the players need to remember all the animals the other players have. The individual player has to establish links between the different animals and the players around the table. In point 7, the number of links is expanded by the creation of connection to the cards and in point 9, the game is made even more complex as more animals are introduced and it makes it harder to remember the animals hidden in the barns, which is of course part of the game designer's inscription.

We continue to point 13, where we see the first match of cards. When this match appears, a special script appears which is part of the inscription of the game. The script forces the player to act as prescribed by the game rules and it thereby functions as a type of mechanism that governs the actions of the players. The mechanism *re-organizes* the connection between the player's body and cognition in a special way by means of rules and materials (cards, animal figures, barns) and, in this manner, the game utilizes the functions of the player. As mentioned earlier, the player is driven to make mistakes when pronouncing words, and it is this "drive" that demonstrates an agency from the game.

What the game does can be described as follows: First, it mobilizes the individual player's memory but overemphasizes the need to remember. There is a wide range of images, sounds, figures, and places in play, and the player will have to revive all of these objects and connections when the match of cards happen. There are different animal figures and their sounds to choose from, and several sounds usually become actualized before the players are able to produce the correct sound.

Secondly, the game cuts across the usual connection between the player's mind and body. In point 13, it is clear that the game disrupts the usually well-controlled connections between the player's cognitive ability and their ability to control their voice. The inscription provides a procedure for a specific requested response to certain signals where the player has to use specific cognitive functions, i.e., perceive, remember, associate images and sounds as well as mobilize the organs of speech; and it all has to happen as quickly as possible. It is a simple task that players do not usually have problems with but, by adding a wide range of signals in the form of different images and sounds, and, by forcing the players to compete with others, the result is that cognitive and bodily functions respond in an incorrect manner and the players end up making wrong sounds. The game has, in a way, taken over body and mind.

The case of playing Quackle is an example of a translation process in action, where agency is delegated to a network. The case is also an example of how such a network is comprised of human, material, and social actors. The translation is only happening because the players have allowed themselves to be enrolled as players and fulfill their roles by using the material and following the rules and thereby delegating agency. In return, they are entertained.

A.   Playing a computer game

Earlier in this article, we stated that we consider computer games to be games before anything else. Thus, our thesis is that computer games do something to the players when played, just as in the case of Quackle What we have

attempted until now is to establish a framework for analyzing what games do, and, in the following, we will briefly show how the framework could be applied to computer games.

The setting, which we observed, are three boys 12, 12, and 14 years old playing Grand Theft Auto V (GTA) on a Playstation 3. GTA has become very popular with its mixture of racing and adventure, where the players can follow a story already inscribed in the game or they can just go racing around in the game city.

The boys take turns at controlling the game while the two others comment and talk about what is happening. In one scenario, the 14 year old is controlling the game. He gets an assignment from the game where a tough looking guy on the screen tells him that he needs to win a race with a computer-controlled opponent to progress. Then the game begins.

The setting, we are analyzing, is a network that consists of the interior (couch, table, etc.), the Playstation (consisting of screen, game console, controller and DVD), the three boys, and the game. The game itself consists of multiple actors of which some are activated in combination with the other actors of the network.

We will not analyze all actors and possible networks the game can initiate but will only take a short look at how the game impacts the players' bodies.

When playing, the boys have to follow the rules of the game. They are complicated, but for our example here we can just point to the traffic rules in the game and how the car is driven via the controller. In the same manner as in a real traffic system, the player has to delegate agency to the system. Just as in the real traffic, there is police; here in the form of multiple cars and helicopters, and there are roads, houses, pedestrians, and the normal traffic on the road, all i of which have to be avoided during the race. All of these actors become active as the boy starts the race which lasts for a few minutes.

It is apparent how the game influences the player's body. To initiate the game, the boy presses hard on the controller and swings it forward, and the next second he and the controller are leaning heavily to the left side, almost leaning into one of the other boys. The next second, all of the boys shout "Wow, that was close!", while they all jump a little in the couch. At the end, they are all standing up and leaning forward and to the side as they follow the movements of the car on the road it tries to follow.

If we look at this scenario as a translation, we can see the problematization is set forward as the boys need to win the race and this is also the OPP. In the interessement, the game builds on the fact that the boys are already enrolled in the game (emerged in it) and thus they need to progress to keep playing. The enrollment is made more stable by the use of a character in the game and adding a storyline to the race (why they have to win), thus agency is transferred to the game. This also builds up the tension for the next moment, where the boys are mobilized to play. The term "boys" indicates that all three boys participated even though two of them did not control the game.

When the race begins, the boy controlling the game is leaning forward and swinging to the side with his body. This is where the game uses some of its agency and the bodily action of the player shows that the game is mobilizing the player's ability. In our observations, we saw this again and again, the players could not help it but move their body to the side as they turned a corner, even though in this game it was not needed, as the controller does not react to it.

The game further uses its agency when it makes the boys shout and jump. This happens as the car almost hits a wall that would have crushed the car and made them lose the game. This kind of danger is present all the time in the race. Here, the game is exercising its agency by using the player's body and mind, including his imagination that allows him and the other boys to experience danger, which in the real world would have produced fear but, in the framework of the game, produces excitement.

VI. THEORY OF PLAY AND GAMES

Obviously, excitement or pleasure is the reason why game players obey to the demands of games in the way we have described above, i.e., accept to act as a node in a network, following rules they often do not understand, using hour after hour trying to learn to manage game challenges. What games do is to produce play and playful experiences for users. In the following, we will lean on modern play theory and modern game studies to clarify the importance of play and the connection between games and play.

One need not search for long in game studies literature before it becomes evident that play, according to most researchers, is an important factor for the success of computer games as well as other kind of games. Prominent play scholars like Johan Huizinga, Roger Callois, Gadamer, and Brian Sutton-Smith appear as references in numerous articles and books on the topic. In Salen and Zimmerman's well know book on games, *Rules of Play* [27], the authors define the goal of successful game design as "...the creation of meaningful play..." [27] and later on state that "...rules are merely the means for creating play..." [27]. And to make the central point absolutely clear, they argue in a subsequent anthology on games that "...games create play: of that there is no doubt." [28]. In other words, games fulfill a function in relation to play.

In line with our view presented here is also [29], [30], and [31]. Games can be seen as "tools" that generate play, and, more importantly, games must be designed with the aim of generating play.

But what is play? In developmental psychology, play is primarily seen as a means for learning (Piaget [32], Vygotsky [33], Singer, Golinkoff, & Hirsh-Pasek [34]) and, in that frame of reference, it follows logically from the statement that games generate play that they also generate learning. Modern play theory sees play differently. Based on the work of the above-mentioned play scholars, play is regarded, in and by itself, as a meaningful human activity that we practise for the simple joy of it. Game players accept the translation of agency to games simply because they can get into play by doing so, or more accurate get into the condition in play theory called "the state of play", derived from Johan Huizinga [35] who is probably the most quoted play theoretician today. He writes in "Homo Ludens" (which translates to "man, the player") about play this way:

"…what actually is the fun of playing? Why does the baby crow with pleasure? Why does the gambler lose himself in his passion? Why is a huge crowd roused to frenzy by a football match? This intensity of, and absorption in, play finds no explanation in biological analysis. And yet in this intensity, this absorption, this power of maddening, lies the very essence, the primordial quality of play. […] … it is precisely the fun-element that characterizes the essence of play. Here we have to do with an absolutely primary category of life, familiar to everybody. […] the fun of playing resists all analysis, all logical interpretation…" [35].

The last sentence is perhaps the most important for the understanding of play and, thus, for the understanding of what games should be designed for. Play is a difficult concept to define in a scientific context because of its nature as an activity, which represents other values than the ones we traditionally use and base our thoughts on. Both in science and in our daily lives, we usually try to rationalize human activities and give them a purpose. When it comes to play, it is not possible to apply rational reasoning according to Huizinga, and play does not submit itself to the usual rational notions. We are forced to remove our accustomed patterns of thoughts and recognize that the human being is something else and more than a rational being. In short: Human beings want to play for the fun of it, and we use games primarily because they can get us "absorbed" in play.

Games, whether board games, computer games or other kind of games (of which we will present an example shortly), should be designed to facilitate this absorption. Traditional games like street games that have been around for long, some for hundreds of years, are clearly designed to produce the joy of play [31]. Games are some of the first things we meet as infants when we learn to communicate. Play researcher Brian Sutton-Smith have given a most precise definitions of play, which is useful to game design, even if it is about infants:

"[…] we postulate as the aboriginal paradigm for play, mother and infant conjoined in an expressive communicational frame within which they contrastively participate in the modulation of excitement. We call this a paradigm for all ludic action, because we suggest that other play itself is a metaphoric statement of this literal state of affairs. Ludic action, wherever it is, always involves the analogous establishment of the secure communicational frame and the manipulation of excitement arousal through contrastive actions within that frame." [36].

"Modulation of excitement" is a very precise description of what games do. There are numerous variations of such modulation. For instance, play can be physical, making the body move forward and backwards, as in sports, dancing, or on a swing; it might be psychological, creating and using a mental tension, for which jokes or horror stories are good examples. It is remarkable in this context that play if often generated by directly using the natural reactions of the body and mind, e.g., dizziness or fear, as we have tried to show in our game analysis.

We employ countless forms of materials, techniques, or genres of physical as well as immaterial types to help initiate activities that make us play. Thus, games are just one out of numerous tools [27], [29], [30] and [31]. From the simplest tools, for instance the games of dizziness, where young children turn around and around to get the excitement of dizziness, to the computer games the goal contains a familiarity. In the next section, we will present games ased on high tech, where we have utilized knowledge of games as tools for play.

VII. EXERGAMES

Exergames is one of the many names for a fairly new type of games. These games try to combine physical exercise with digital games through an interface that requires physical exertion to play the games [38], [39].

Exergames are interesting here because they combine the physical abilities of the players with the opportunities of the digital games. At the same time, many of these games are less complicated than computer games like GTA, because they rely on the physical aspects and movements of human players and less on the virtual world's narratives. This allows us to further investigate how the human players are being used within the network of a game.

In the following, we will look into one type of exergaming called modular interactive tiles ("tiles" for short).

The tiles (displayed in figure 2) are a distributed system consisting of electronic tiles, which can be assembled like puzzle pieces. The tiles combine robotics, modern artificial intelligence, and play in a product that can be used for games, sports, health promotion, rehabilitation, dance, art, and learning[39].

Every tile is 30 x 30 cm and works independently but is able to communicate with all the surrounding tiles. In this way all the tiles can communicate with each other and create a playfield for the players to play on. The tiles have a force-sensitive resistor and eight RGB light-emitting diodes able to shine in a rainbow of colors.

The many colors allow for a variety of different types of patterns and games to be played. To play a game on the tile platform, a player must move around and step on the tiles according to the rules of each game (see later). The various applications can either be played by a single person or can be set up so that multiple people can collaborate or compete against each other.
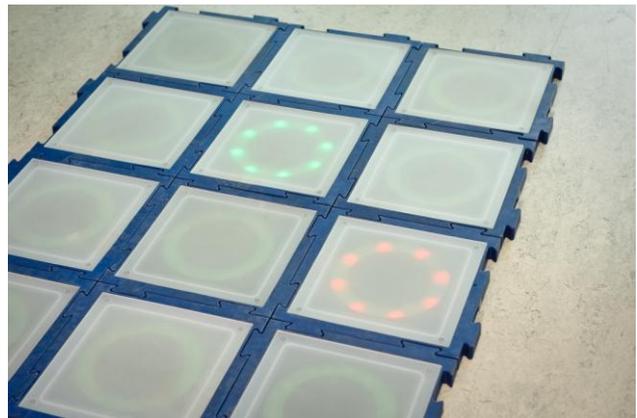

Figure 2. Modular Interactive Tiles.

Because the tiles are designed to work in any combination and because of the puzzle piece design, the tiles give the user the ability to create any playing field they wish, and to change it again anytime - e.g., change the size or shape of the field of tiles. When the user changes the configuration of the tiles, the interaction and difficulty is also changed, e.g., faster/slower movements, longer/shorter steps and so on. Thus, the user has the ability to change the movement and difficulty merely by physically building a different kind or size of the platform.

The tiles have been used as balance training for elderly people (65+ years old) and motor skills training for children (5-6 years old). We observed both elderly and children (total of 20 sessions for each group), but here we will focus on the sessions for children. Each participant participated in 10 or more sessions and a total of 19 children participated.

The data were analyzed using the methods described earlier and the following account is a prototypical example of the use of the tiles for children even though similarities exist in the use for the elderly. This example illustrates the main findings and forms a good basis for the ANT analysis. For the sake of the analysis, we are focusing on one game called "Color Race", (see [39] for more info on the tiles).

The game "Color Race" is a type of "Catch the Color" game. On the playing field, three tiles is randomly displaying different colors – red, green, and blue. Each player chose a color and has to step on the tile with the chosen color as fast possible. When they step on the tile, its color shifts randomly to another tile on the playing field that the player now has to step on.

The player has to step on tiles with their chosen color as many times as possible within a given timeframe (typically 30 sec). When the time is up, all tiles light up in the color that got most points. Hopefully, the reader can imagine three players running around on the relatively small playing field at the same time trying to step on tiles as fast as possible. The stage is set for rough-and-tumble play (in our experience regardless of age).

In the scenario that we believe is a prototypical example of the use of the tiles, we are in a kindergarten with 10 children 5-6 years old and an adult. The room is full of other toys, but there is room in the middle of the floor for the tiles. They also have chairs that some of the children are sitting on while they are waiting to play. Others are standing around and cheering or observing the children playing. The children are playing with the tiles two times a week, so they know them at this point. The adult helps to set up the tiles and they are placed in a typical setup of 9 tiles in a 3x3 square, and the game Color Race with three colors is started. Three of the children pick a color each, and they place themselves in front of that color and count down to start.

As soon as they start the game, they jump from tile to tile trying to get around the other players, but they keep bumping into each other again and again as the playing field is approx 1x1 meter so they do not have much space to move on. The game lasts for 30 seconds where the players jump around and get around 20 points each. At the end of the 30 seconds, the tiles light up in green showing that the green player got the most points.

As described above, the game requires the player to step on the tiles for the game to proceed. Here the inscription is the tiles in general and the game of "Color Race" in particular is calling for the player to step on the tiles. In our observations, we have seen this time after time. New players or observers can not resist trying to press the tiles to see what happens. The physical design of the tiles on the floor, the size of a foot, and the colorful light invite the player to step on them. They function as trigger points.

If we look at the inscription, it can be described as follows: The player must press a tile and catch as many lights as possible within a limited time frame. The game is created so the color jumps to another tile almost instantly and this creates the feeling of running after the colors, thus the name "Color Race". The movement of the light to another tile "forces" the player to act as prescribed be the game rules but also the surrounding network of competing with other children, and the observers cheering on is contributing to this "force". This is another example of what we saw earlier with Quackle!, where the players are driven to act in a certain way.

If we look at the inscription, it can be described as follows: The player must press a tile and catch as many lights as possible within a limited time frame, which organize both body and mind of each player and the interaction between them. The game also creates the necessity of speed by organizing the game as a competition. All the sessions we observed with children involved multiple players on the platform, and with more players at the same time, there is also an element of competition and a lot of communication between players. Notably, the kind of friendly communication connected to play and games. It is noteworthy that all of the players, we have observed, talk, shout and laugh. The game evokes a kind of friendly play fight.

It is of special interest from our viewpoint that the game sets up the players not only as players, but at the same time as material obstacles in the game. In the scenario with the tiles, the players are all playing at the same time and the colors jump around the platform. Here the game is using its agency. As pointed out above, the game is forcing the players to move from one tile to another, but in the process it creates a "double" role for them as players also become obstacles for other players. This "double" use of the human player is important for how the game functions. Each player becomes a game element, as they again and again are standing in the way of others who are trying to reach a tile with their color.

In the observations, we could see that exactly this point was critical for how much fun the participants seemed to get out of the game. If they surrendered to the game and accepted and maybe even used the fact that they bumped into each other, they seemed to enjoy the game more. Often players tried to push, pull or bump the other players away so they could easier reach a tile.

The game is also pushing the players to speed up and jump around by shifting the position of the light almost instantly as the tile with a color is pressed. It creates the effect of the game progressing fast, and players indicated that

they felt the need to hurry to the next tile even though the color will stay there until pressed. Technically, there was no need to hurry but mentally it appeared so.

If we consider the case as a translation we can then observe the problematization as the case of the children wanting to get into play (the state of play or play mode), and the tiles are put up as the OPP. In the interessement, the children are convinced that the tiles are the solution to the problem and the roles are divided with the children as players and obstacles for each other, the tiles as the playground and the place the game will take place.

The children and tiles are enrolled and they accept the roles in the enrollment and they accept the rules of the game, they accept that they will become both active players and obstacles in the game.

In the final moment the actual game is played. The children run around on the playing field and the tiles make them shift from one tile to another, shifting their balance, running into each other, and fighting to get the most points and by doing that clearly producing the state of play.

In this case, we tried to make it clear that the players can take multiple roles in the game, and that the actors of the network can be used both with their mental abilities (e.g., competitive revivals) as well as their physical or virtual manifestation (e.g., obstacles or trigger points).

In the following, we will go deeper into what the implications of these analyses of games in the view of ANT have for designers of games.

VIII.   DESIGN IMPLICATIONS

In the introduction, we stated that games, in our point of view, could be regarded as actors because they function as organizers of other actors. Following Latour, quoted above, games are actors because they make a difference; not because they are human or non-human, social or material. We have tried to show how such "difference" is created when games do something with players. This view represents an understanding of interaction where the subject-object dichotomy is dissolved and agency is distributed in a process of reorganization, recreation and modification of actions in networks that even stretch into the mind and body of the individual player and take advantage of abilities and faculties.

If one accepts this way of viewing, it will have implications for game design, because design is not just a question of creating game worlds and interfaces but also a question of how to design social actors that can take agency and thereby initiate and guide the building of social networks, which can bring human and non-human actors to act together in such a way that the players can achieve an experience they find pleasant, joyful, funny or equivalent. As we have tried to point out, this does not only involve organizing social relations, actions and material, but also requires utilization of the player's abilities, for instance of both physical and cognitive nature.

We believe game design should be done on the basis of knowledge about how human abilities can be organized and influenced including knowledge of the abilities of different user groups. In the analysis, we showed how games orchestrate actions by humans and non-humans and resulted in experiences the players find engaging, joyful, and entertaining. From our point of view that is prototypical examples of what games do. They organize the acting of actors in order to achieve certain kinds of experiences, which, as we have argued, primarily are states of play

Through the inscription, the designer assigns agency in such a way that the game can take advantage of the characteristics of the human players. The games are examples of how the designer renders agency to a non-human object, and how these objects perform a job by getting the players to do a job.

This view gives us a possibility to further investigate how the designer can utilize this understanding when creating games.

Understanding games as active participants in the network created by or around the game, puts emphasis on attributing agency to the game and the elements in it. To understand how this is done, the concept of framing is useful.

Framing is a concept developed by Gregory Bateson [40], who points to the fact that certain situations are perceived differently than we normally would in his essay with the title "This is play" [41] which is now famous both in the context of communication and play research.

The classical example from Bateson is two monkeys playing; where in this framing a bite (an act of attacking)) does not denote what it normally would (fighting against each other) but is framed in such a way that it is percieved differently. Bateson states that a bite in the frame of play has to be followed by a metacommunicative signal "this is play", so that the opponent understands it as an act in play and not seriously meant [40], [41]. This is, for instance, the case with computer games such as GTA that we have described earlier. "This is play" puts a frame around every act which signals "not serious". But that does not mean that the acts are without influence on the players. For our viewpoint, this is a tricky point which we have to elaborate on.

The best example is perhaps the feeling of fear. Psychologist and play researcher Michael Apter [42] have put forward the example of meeting a tiger. There is a significant difference between meeting a tiger face to face in the backyard and meeting tiger in a cage, he writes in an attempt to explain that the way we experience our surroundings changes their significance due to the frame we put them into. This is especially true in play. That which outside of play would produce fear, anger and the like, does not produce the same reactions in the framework of play. Still, as the Apter example shows, what we experience in play has to *evoke* some of the same feelings as reality. If not, we would be bored. A kitten in a cage is not exciting but pittyful. We believe this is a key point in designing games. The "modulation of excitement" of course requires something to modulate. Fear is only one example. Apter writes: "One of the most interesting things about play is the tremendous variety of devices, stratagems and techniques, which people can use to obtain the pleasure of, especially to achieve high arousal […]. Putting aside the use of direct physiological interventions to increase arousal – drugs

smoking and drinking – there are a number of general psychological strategies which can be used for this purpose" [42]. A designer must know which emotions, feelings, etc. that produce arousal or other kinds of excitement and joy in the specific target group, and must know how to evoke them in a game. Good designers know that by intuition; however, explicit knowledge may help to make games better or to better avoid failures.

In terms of a game taking agency, the key point is to set the scene for the game; creating a framing where the players are willing to invest time and energy into the game and in the process distributing agency to the game. The players also have to accept the roles and rules of the game. Often this framing is done in the terms of narratives where the designer includes a story that frames the game and divides the roles.

Dividing the roles and hereby building the social network is an important part of the work done by games. This is also the first part of the translation.

We described this in the case of Quackle and how it divided special roles. This is especially clear in GTA and the case of the tiles. In GTA, the social network is built to include the actors of the race but also draw on the bigger picture of why players have to advance through the race. In the case of the tiles, the social network is constructed to create a social awareness of the actors and how they compete and play around with each other.

B.   A word on scripts

The social networks and relations, actions, and materials are not the only elements to take into considerations. The most vital part that the ANT analysis points to, is to take the abilities, feelings and emotions of the players (physical as well as psychological) into account. As described earlier in the inscription, the designer can take advantage of the scripts that the players already have "downloaded", e.g., the fear of tigers, to mention a simple script.

In the example of Quackle, it was the ability to make the sounds of the animals combined with a common script that made us laugh when we and other people made mistakes inside the frame of play. In the case of the tiles, it was the game structure of "Color Race" where the players had to "catch the color" combined with the script of playful fight. Players know this kind of game; they know how it is played and the designer can use this knowledge.

All these examples are scripts in different types. As described earlier, scripts are a form of manuscripts that we know and which we use to interact and cope with different situations. In a sense, scripts can be seen as a form of recipes.

In that sense, games are dependent on the players. Players have many different scripts and understandings of how to play and what a game is. All these can be seen as part of their play culture. When players play a game or observe others playing, they learn new ways of playing and interacting: new scripts are passed to them.

It is sometimes easy to see, as when a child looks at elder children playing and starts to mimic their behavior. In this situation the child is starting to "download" the script for their actions and can later reuse these.

In all these small scripts, we have learned that the designers of game are using them in different ways while they are at the same time supplying new ones to the players.

IX.   CONCLUSION AND FUTURE WORK

The main theme of this paper has been to establish an understanding of what games do in the perspective of ANT. We have seen how games do an active job and work as what Latour calls a mediator that can "transform, translate, distort, and modify" relations [12]. We believe that ANT is beneficial when we look into computer game design. While it can seem trivial that games do something to users, it is highly important for game designers to understand how games do this and why people are willing to invest time and effort in games.

We have demonstrated that, using ANT as a tool for analysis, can give us a new understanding of the interaction between games and users. We believe that game designers can advance interaction design by "following the actors" and by understanding how agency in games works, and by gaining insight into how certain bodily, psychological, and social acts can create play. We are fully aware that our analysis has shortcomings since it only covers three games although several instances of them and, thus, only a few examples of the kind of actor network which creates play. There are numerous other examples of this kind of network operating in many different ways in games.

Future work should focus on identifying, characterising, and possibly systemizing actor networks in different games. It should also focus on identifying different kinds of key scripts that the designer can utilize and take advantage of. Similarly, it's interesting to further investigate how the understanding of games as translation can help create a better awareness of what is going on in the process of game description.

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