The Dynamic Design Space During a Game Jam

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ABSTRACT

Game jams have gained an increasingly important role in game development communities, and have attracted attention in academia as well. However, research on how game jam formats shapes and drives creativity and design processes is scarce, and needs further development in order to advance our understanding of unique types of design processes. To provide insight on the complex inner workings of game jams, this paper presents an autobiographical design case study demonstrating how design space theory may be used as a theoretical framework that supports the documentation and analysis of a game jam**.** The main contribution is detailed exemplars of events that, for this particular game jam, had significant influence on how the design space was transformed. Furthermore, we discuss several points of interest for future studies of the transformation of the design space during game jams.

CCS CONCEPTS

• General and reference → Design • Human-centered computing → Interaction design process and methods

KEYWORDS

Game Development, Creativity Constraints, Design Space, Game Jam, Game Creation Event, Design Process

1 Introduction

Game jams have gained an increasingly important role in game development communities and industry, and are today used for many purposes, for instance: networking and socialising, experiencing a full game creation cycle, learning to work in a multidisciplinary group, learning about time-management, testing new and creative game ideas, building portfolio pieces, and rediscovering passion for game creation by senior developers [24]. Game jams may be defined as: "…an accelerated opportunistic game creation event where a game is created in a relatively short timeframe exploring given design constraint(s) and end results are shared publically." [14]. This definition does not offer a rigorous description of what constitutes a game jam, but instead reflects its many different formats. Game jams may therefore differ significantly with regard to rules, context, setting, participants, stimuli, guidance, time frame, and goal [14].

In recent years, game jams have also attracted attention in academia [8, 14, 29]. The academic attention toward game jams happens in a time when game researchers increasingly look toward game designers and their creative processes [16], and when the Human Computer Interaction research community (HCI) increasingly looks toward user experience studies, including emotionally engaging experiences such as digital games [22]. Some have argued for bridging game studies with design research, as sometimes occurs within the HCI research community, to support game studies with a well-established field of research in order to advance our understanding of game designers and their creative processes in designing games [12, 13]. In this paper, we continue this bridging.

In a study by Preston et al. game jammers rated the quality of their game to be 3,12 out of 5, while they rated the game jam's effect on their programming, art and design skills was rated to be 4,14 out of 5 [25]. Interestingly, even though the jammers rated the quality of their games to be only average, the jammers' experience of participating in the game jam was perceived as beneficial [25]. Motivated by this perceived benefit of game jam participation, we are particularly interested in the inner workings of game jams, and to support the understanding of game jams as a certain kind of design process. As game jams are increasingly used for several reasons in different contexts, it is essential to develop a better understanding of this kind of design process in order to support game jam participation, organization and research. In the longer term, we aim to further develop our theoretical understanding of the creative design processes in accelerated design processes, such as in game jams and hackathons.

Some game jam researchers use data collected from the online Global Game Jam (GGJ), which has an established research committee (GGJ-RC) aiming to: "…promote, facilitate, organize, and conduct scientific and technical research activities related to innovation, experimentation and collaboration." [8]. The GGJ-RC have utilized a unified data-gathering mechanism by providing

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global massive-scale surveys including questions by approved research projects [8]. These surveys are then passed on to all GGJ participants. Though large-scale studies provide important insights on the breadth of certain phenomena in groups, they can lack the depth as provided by detailed exemplars [6]. As Zook and Riedl noted in their survey study of the GGJ in 2013: "[s]urvey responses are limited to the most salient aspects of an experience, preventing detailed processual information gathering." [31]. Others have conducted qualitative studies of game jams [17] and hackathons [18], and this paper is in line with the approach used in these contributions. To provide detailed insights into the inner workings of a game jam, this paper presents an autobiographical case study [4] of a game jam, wherein the first author observed, documented and participated in a 48-hour game jam together with a group. Documenting design processes, such as a game jam, can provide insights into the project's underlying rationale: choices made, breakthroughs, challenges, or paths not taken [1].

Building on pragmatist design theory, our study examined the game jam design process of a group, in which the first author participated in, can be documented, described, and analysed as a dynamic transformation of a conceptual design space. Biskjaer, Dalsgaard and Halskov suggest that the documentation and mapping of a design space can be supported by an annotation technique, represented by matrices, called 'design space schemas' [2]. These schemas give an overview map of the opportunities in a design process. During the game jam, the first author created several schemas that reflected the opportunities that we as a group were facing. The schemas reflect how our design space expanded when we generated ideas or multiple options for a design decision, and how our design space was reduced when we faced challenges where we had to change or eliminate design decisions. To support the subsequent analysis of *how* the design space transformed, the first author used additional documentation techniques during the game jam. The contribution of the autobiographical case study is a detailed account of the game jam as a transforming design space and a discussion of interesting findings and directions for future research into the inner workings on game jams.

The structure of the paper is as follows: First, the theoretical background of this study is presented, second, the specific case and method used to study the case is described. Four events in particular shaped the design space significantly during the game jam. The four events were:

1. Initial establishment of the design space.
2. Elaborating the design space.
3. Inquiry into gameplay options.
4. Finding alternative design decisions because of a gameplay breakdown in the digital prototype.

Third, the four events are described and analysed. The paper concludes with a discussion of the particular case study and of the contribution of using design space as a theoretical perspective on game jams.

2 Theoretical Background

To explore how the design process of a game jam may be documented, described, and analysed as a dynamic transformation of the design space, we adapt Biskjaer et al.'s understanding of design spaces, which they define as: "[…] a conceptual space, which encompasses the creativity constraints that govern what the outcome of the design process might (and might not) be." [2]. The definition builds upon Schön's pragmatic perspective [28], in which a design space denotes a conceptual space of opportunities constructed and developed by the designers via inquiry. A design space limits opportunities for the design process in some areas, while in other areas opens up opportunities for creative exploration for the design process, as it encompasses the creativity constraints that govern the design process. In this sense, constraints become part of the designers' resources [2], and a total absence of constraints may undermine creative thinking [3]. Concerning the facilitating nature of constraints, three different types may be considered [20]: 1) *Intrinsic constraints* can be dictated by materials, such as the limitations of different kinds of hardware. 2) *Imposed constraints* are external, such as stakeholder requirements, or a time frame. 3) *Self-imposed constraints* are constraints imposed by the designers themselves.

Related to this study is Kultima et al.'s investigation into how developers experience different kinds of constraints in a game jam setting, based on an interview [15]. Kultima et al. concludes that game jam participants work with several design constraints, and that a general understanding of constrained development scenarios such as game jams can advance several areas of game creation [15]. This paper shares the same interest in how participants experience constraints in a game jam, however this study frames creativity constraints as the building blocks of a dynamically transforming design space. Hence, our interest lies in documenting the *temporal* transformation of the design space, the interplay of design decisions, and how people create, encounter, and manage creativity constraints, and thereby transforming the design space.

The transformation of a design space is an essential element of the pragmatic perspective on the design process. The pragmatic perspective applies an experimental approach to the world, since predefined conceptualizations of the world will likely change meaning over time [28]. The design space *changes* when the designer understands more of the design situation they address, and examines new approaches and opportunities while discarding old ones [2]. This happens through the designer's inquiry process, in which the situation 'talks back' to the designer following an experimental design move, therefore informing the designer's revision of their next steps [27]. Inquiry is characterized by an experimental what-if approach, where the early stages of a design process, in particular, are oriented towards exploration of the design situation [19]. To obtain a preliminary understanding of the design situation, the designer draws on their own experience and knowledge, also called the designer's repertoire, which is the point of departure for inquiry [19].

Exploring the ways in which a design space transforms during a design process makes it possible to analyse and assess the process as a whole. The design decisions that were used in the final design, and those that were discarded, may then be analysed, discussed, and assessed [5]. In this sense, the analysis of a design space goes beyond treating individual representations of the designer's actions, such as sketches and prototypes, by encompassing how these elements influences each other, and their interplay with the development of the design space [5].

Biskjaer et al. suggest that the documentation and mapping of a design space may be represented by design space schemas [2], which gives an overview map of the opportunities in a design space. The opportunities in the design space schema consists of aspects (for instance 'input technology'), which are arranged in the upper row, and of options or alternatives (for instance 'VR, Kinect, keyboard'), which are arranged in columns underneath each corresponding aspect. A design space schema addresses the potential properties of a future outcome of a design process, and describes the design space at a given point in time [5]. The schemas do not present the entire design space, but offer an overview of its most important and salient aspects, and may make certain factors of the design process explicit to support the analysis and reflection on the design space and its transformation [5]. Based on a single case study using design space schemas, Biskjaer et al. propose five strategies which designers used to transform the design space: 1) *Dynamically removing and adding aspects*; 2) *Dynamically removing and adding options*; 3) *Brainstorming with regard to options in one aspect*; 4) *Temporarily ignoring aspects*, and 5) *Deciding (perhaps only temporarily) on one aspect to consider the implication with respect to another aspect*. In the discussion, we will relate the findings from the analysis to Biskjaer et al.'s suggested strategies.

3 Case and Method

Musil et al. have suggested studying game jams by: 1) conducting participant surveys before the game jam begins, 2) making a constant observation report during the event, 3) studying a single group's process and project in detail during the game jam, and holding a retrospective interview with the group after the event [21]. This study primarily applies methods 2) and 3), with a focus on the context and design space of the game jam. The case study in this paper is also inspired by how others have addressed game design, and thereby contributed to this particular field in game research, for example, by doing extensive ethnographic fieldwork in game studios [23], and conducting ethnographic studies of a group's day-to-day activities at a game company [30].

The game jam we studied was the Nordic Game Jam 2016. Nine hundred people participated, and it lasted 48 hours during a weekend, from Friday to Sunday. On the first day, in the evening, the theme of the game jam was revealed to be 'Leak'. Before the game jam, the first author gathered a group of people that was planning to go to the game jam, and they agreed to participate in the study. The first author briefed the group about how and why their design process would be studied. The group consisted of six people, including the first author, and all people in the group were acquaintances beforehand. The group members had different roles during the game jam: an audio designer (AD), a graphic designer (GD), three programmers (P1, P2, P3), and first author as a level designer (LD). All group members had prior experience in the roles that they took on during the game jam. None of the group members, except the first author, had prior experience of developing a game in a game jam setting, but had novice experience of game development from educational settings. During the game jam, the group sat in a room together with two other groups, creating a busy environment. The room had several blackboards, which were used during the game jam.

As the case study was conducted as autobiographical design, the method acknowledges the role, the perspective, and the experience of the researcher, who simultaneously designs, builds, and uses their own designs [4]. This method, though still uncommon, has become more frequently used in HCI research, and is one example of a first-person research method used to study the complex and multifaceted relationships between humans and computers [4]. Though game jam prototypes are playtested and demonstrated respectively throughout, and in the end of a game jam, the focus in this case study is more on the designing and building than on the using the prototype as the game jam process is our primary research interest. In line with autobiographical design, the following analysis of the game is written as an account of how the first author, as the researcher, experienced the game jam transformed as a design space. As an essential part of the autobiographical design method, the analysis is written with transparency and sincerity in mind. In order to meet this, the data collection is described in detail in the section below.

Eleven design space schemas were created during the game jam. To support the subsequent analysis of *how* the design space transformed, largely represented in the schemas, first author also:

- kept field notes
- recorded 4 hours and 29 minutes of group discussions and smaller contextual and informal group interviews [11], divided between 23 audio clips
- collected 18 screenshots
- took 26 photographs

As the first author simultaneously participated as a level designer and as a researcher documenting the design process, the data was collected based on first author's judgement of when our design process had a 'transforming' character or had the potential for a transformation of the design space. Specifically, a transformation caused by opportunities that opened the design space up, or challenges or design choices that narrowed the design space down. In practice, transformations of the design space were often most obvious during group discussions of concept and implementation related design decisions. In this sense, the collected data is 'reflected', as it is based on judgement made in situ of the game jam. Furthermore, the first author judged when and what kind of data was appropriate to collect without disturbing the design process in this fast-paced setting. This was important, as we wanted the game jam to be as authentic as

possible, without being hindered or altered too much by the data collection. This is not to be confused with a pursuit for objectivity; and as aforementioned, the method highly acknowledges first-person experience. One example of how the documentation supplemented the analysis of how the design space changed is how audio recordings captured design considerations leading up to the first author noting the change in a design space schema. After the game jam, the group interviews were transcribed and coded with regards to how actions and experiments conducted by the group transformed the design space.

To test and gain experience with this kind of data collection in a game jam setting, the first author conducted a pilot study at a 72-hour game jam before the 48-hour game jam. Based on the pilot study, the data collection method was further developed to accommodate for the fast-paced format of the design process. For example, interview guides were changed to be less structured, and leave room to improvise according to the context. The first interview in the beginning of the game jam revolved around how people were setting up workspaces for themselves and what tools and software were to be used. Later interviews during the game jam revolved around conceptual and implementation related design considerations and concerns, how people were testing their work and collaborating. Often the contextual interviews during the game jam would begin as an interview situation in which only the first author, as a researcher, would ask questions, and later develop into group discussions of design decisions instead, thereby losing the character of an interview situation. This was a consequence of the contextual interview form, since the topics of the interviews were relevant in the moment and were often urgent design concerns.

3.1 The Game Jam Prototype: Cobots

To give the reader an idea of the direction of how the design space transformed during the game jam, the final game jam prototype is briefly presented here. The final game prototype is a local two-player game, called Cobots, in which two players must cooperate to win the game. Figure 1 shows a screenshot from the game.

Figure 1: The final prototype is a local two-player game.

Each of the two players control a drone that has chains hanging from its underside. The players have to manoeuvre the drones so that their chains grab a nuclear reactor object and carry the object to safety in a container. The object may hit the walls a maximum of nine times before it explodes, and the players lose the game.

4 Analysis

In this section the pronoun 'I', and terms like 'we' and 'my group' are used to reflect the perspective of the first author. The following analysis based on the data collection, identifies four key events which had a particularly transforming effect on the design space. The four key events are: 1) establishing the design space, 2) elaborating the design space, 3) inquiry into gameplay options, and 4) breakdown of movement and gameplay in a digital prototype. An overview of when the four selected events happened during the game jam can be seen in Figure 2. The events are presented as detailed accounts to give the reader a better understanding of a complex design process under the circumstances of a game jam. Events 1 and 2 occurred in the evening on the first day of the game jam, when my group's design process was generally oriented towards exploration of the design space. In particular, event 1 was characterized by an experimental what-if approach. Event 3 occurred on the second day, and encompassed design moves, such as sketching and prototyping, that elaborated certain aspects of the design space. Event 4 occurred on the second day in the evening and early morning on the third day, and was prompted by a breakdown of certain aspects of the design space, which negatively influenced other aspects.

The four events are not necessarily representative for all game jams, but had in this case study particularly transforming effects on the 48-design process. During design processes, such as game jams, the design space is constantly transformed, and other events in other game jams may have greater impact on how a design space is transformed than the four events mentioned here. Additionally, the four events in the following sections may give the impression that the design space was only transformed during these four events; rather, as the conceptual design space is constantly transforming, the four events are only points in time when the design space had a particular transformative character, in the sense that many opportunities were considered at those points in time.

4.1 Establishing the Design Space

Until a general game concept was agreed upon, late on the first day, my group diverged, and generated a number of different ideas. We decided to write down on a blackboard the associations prompted by the theme, to support idea generation. The game theme served as an imposed constraint that directed my group's discussion of associations. Writing down the associations revealed our current sources of inspiration, hinting at our repertoires by making the associations explicit through a mind map. As the mind map evolved, my group's externalized associations with the theme

FRIDAY		SATURDAY		SUNDAY
Event 1	Event 2	Event 3	Event 4	

Figure 2: An overview of when the four selected events happened during the game jam.

would 'talk back' to us, and we would reframe these as inspiration for new associations. The final mind map reflects several kinds of associations with the theme: associated verbs and nouns describing concepts, actions, objects, and already existing game titles, such 'fluid', 'escaping container', 'entering container', 'industrial espionage', 'battery container', 'radioactive. The associations were not suggestions for game concepts to be developed, but directions for themes that the group could pursue and further define, in order to create game concepts detailed enough to be implemented. The associations were not yet clearly defined aspects or options, for example, the written association with 'whistleblowing' did not describe whether it was a game mechanic, a story line, or something else.

At this point, the design space evolved too quickly for it to be meaningfully captured by a schema. The formation of possible aspects and options for the design space became clearer when my group discussed suggestions for game concepts, rather than associations related to the theme. Some of our group discussions revolved around how various elements from already existing games could be used as sources of inspiration. For example, P1 described an existing game to P2, while GD listened in. Afterwards, GD suggested an idea for a game concept. Suggested game ideas based on elements of already existing games were considered, given the group's limited time frame and skills: "I'm not sure if we should think about classes and stuff, that might be over our scope maybe. But like, the situation of two people trying to coordinate themselves, whilst sort of working in an environment is quite interesting." (GD).

The start of the game jam assumed the character of explorative inquiry into my group's general associations, and our knowledge of existing games as possible sources of inspiration. Gradually, my group expressed verbal matchings of expectations within the group itself, or put differently, my group imposed constraints on ourselves that would become pivotal in the subsequent design process. For example, 2D perspective was favoured over 3D perspective, since my group's graphic designer could more quickly generate 2D perspective. GD also expressed a personal interest in the possibilities 2D perspective creates for perceiving depth via parallax. After a discussion on different game concepts, we agreed on the theme of 'drones', which served as a self-imposed constraint on the rest of the design process.

After establishing the overall game concept by framing the various constraints both verbally and in writing, my group's design process became convergent. This was evident in interviews with my group and in the development of the first design space schema. From that point on, the design process revolved around elaborating, testing, and implementing the concept. Sketching and prototyping played a crucial role in the design process, and in how the strategies of dynamically removing and adding aspects and options in the design space were carried out. This is reflected in the following events, which to a greater extent encompass strategies that involve the development and navigation of a design space, rather than the establishment of one.

4.2 Elaborating the Design Space

After my group had written theme associations on the blackboard, we discussed various aspects of, and options for the design space, related to the self-imposed theme of drones. For example, we discussed the key terms: 'sci-fi futuristic', 'humorous', and 'frantic', options that the audio designer could use to design the musical aspect of the design space. Various options for level design were also briefly discussed: 'long corridor', 'open rooms', 'pipes', 'constrained rooms'. We decided to keep the level design options open, until we agreed on options for gameplay, or how and why the player should play the game.

After sketching a drone on the blackboard, (see figure 3), we discussed how a drone game character should react to the player's input: "We have the drone, and then you press "wasd" (keyboard keys), and then the drone tilts that way. If you press both of them, you move straight up. And if you press this one you move that way." (P2). The same sketch supported discussions of possible options for gameplay, for example competitive or cooperative gameplay, and prompted suggestions for gameplay that was reflected in the final game: "Ok, we have to carry this thing up, because we are two drones – we have that control scheme so we have to balance and cooperate, to maybe lift it up evenly." (LD). Since the process now focused on a certain direction for the design space, where aspects of the design space concerned cooperative gameplay involving drones, the first design space schema could be formed (see figure 4)

Figure 3: A drawing on the blackboard of a drone. It was used for discussion of how the player should interact with the game.

Character Design	Gameplay	Props
Flat on top: Carry something	Balancing box on top	Container with fluid
Head: Carry underneath	Holding box underneath (hooks)	Container with glowing stuff
	Holding box underneath (magnetism)	
	Cooperative	
	Cooperative with possibility of ruining it for each other	
	Single player	

Figure 4: The first design space schema, made at 9:50, the second day. Aspects are in the top row, and options are in the columns beneath.

Character design	Gameplay	Props	Movement	Music (mood)	Level design (depends on difficulty controlling)
Flat on top: Carry Something	Balancing box on top	Container with fluid	Gyro stabilizer	Dark: Deep tones base	Starting space
Head: Carry Underneath	Holding box underneath (hooks)	Container with glowing stuff	How do we turn with stuff on our heads?	Sounds from drones lighten it up ('bleep bloop')	Narrow space
	Cooperative		Flying in the direction indicated	Pace: fast	Horizontally-stretched space
	Cooperative with possibility of screwing it up for each other		Controls 2 motors	Lighter melody on top of base	Push-button opens door -> fly fast horizontally
	~~Single-player~~		Gyro stabilizer oscillation until horizontal		Falling debris part
	Shooting hook (action)				Rotating ventilator
	Shooting = power up?				Drop zone
	Grappling hooks up and down, but also on top of head, if player wants it				Build level from negative space
	Checkpoints				

Figure 5: A more elaborate design space schema, made at 11:45 the second day. The schema reflects the team's exploration of how the game idea could be made into a prototype

The elaboration of the design space reflect how my group further developed how to incorporate drones into the game and how aspects of the design space were articulated, and various options were discussed. In particular, the movement and gameplay aspects, and their respective options were added, supported by the blackboard sketch. Thus, the sketch wove together the development of the movement and gameplay aspects. This suggests that generating ideas for options related to one aspect, here, in the form of a sketch intended for discussions of the movement aspect, also affects other aspects and their options. At this point, other aspects, such as character design, were not in focus.

The elaboration of the design space reflect how my group further developed how to incorporate drones into the game and how aspects of the design space were articulated, and various options were discussed. Recalling Biskjaer et al's five strategies, the elaboration of the design space encompassed several strategies. The construction of the first design space schema reflects how aspects of the design space were articulated, and various options were discussed. In particular, the movement and gameplay aspects, and their respective options were added, supported by the blackboard sketch in figure 3. Thus, the sketch wove together the development of the movement and gameplay aspects. This suggests that brainstorming about options related to one aspect, here, in the form of a sketch, and intended for discussions of the movement aspect, also affects other aspects and their options. At this point, other aspects, such as character design, were not in focus.

4.3 Inquiry into Gameplay Options

On the second day of the game jam, my group discussed how the drone game characters should be designed to support gameplay, and signal to the player how the game should be played. This discussion is reflected in the design space schema in figure 4, where the two options for the character design aspect represent the consideration of whether or not the drones should have flat tops, to signal if the drones could carry objects on them. My group argued that this design decision would depend on the character of the gameplay and that we would need to test the alternatives with a prototype. Several sketches of various suggestions for level designs were created to prompt discussions about possible gameplay and further support the design decision related to gameplay.

Examples of how the gameplay might look with some of the level design options were also sketched, see figure 6. We weighed pros and cons based on a programmers' prototype and my level design sketches. After voting, my group opted for cooperative gameplay between two players whose game characters used chains beneath them to grab objects. The focus on level design reflects a more detailed focus on how the game concept could be implemented in a game engine, by adding options for what the player could see, and the kinds of challenges the player might meet, as he or she played the game. The creation of the 'level design' aspect correlated with the discussion of the 'gameplay' aspect, or how the player should play the game in order to complete it. Thus, the 'level design' aspect may be seen as the specification of exactly

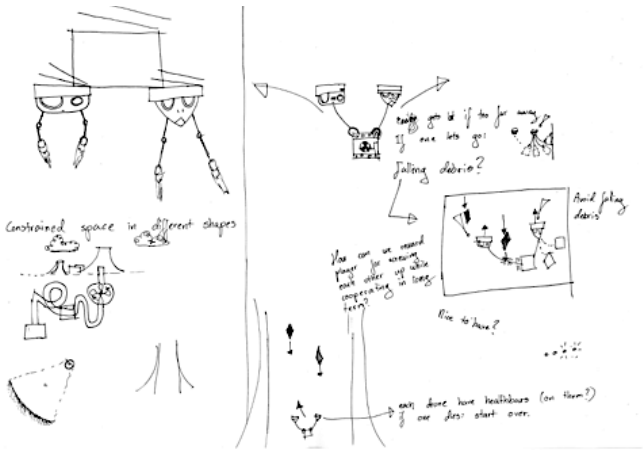

Figure 6: A sketch showing level design suggestions for two different kinds of gameplays, separated by a line in the middle of the sketch.

how the game should be played. This is reflected in the more elaborate design space schema, seen in figure 5.

In event 3, my group dynamically added options, reflected in the development of the level design sketches, which clarified the level design aspect. The sketch added several options to the level design aspect, for example: a starting room; a narrow space for the drones to navigate in; buttons that open doors; falling debris that the drones would have to avoid. My group decided that it would be a good idea to develop suggestions for level designs, to prompt discussions about how a possible gameplay might look. Thus, we considered the implications of one aspect with respect to another, in this case, the level design and the gameplay aspect, respectively. This involved temporarily ignoring other aspects, for example the audio aspect.

4.4 Breakdown of Movement and Gameplay

Late on the second day, my group experienced problems with programming the drone characters' movement. The breakdown involved the implementation of the chain that the players would use to grab objects, and affected the behaviour of the game and the interactive output. The choice of the chain, which was a central part of the gameplay, proved difficult for the programmers to implement because of intrinsic constraints in the game engine. This constraint affected several aspects: 1) the movement aspect, as there was inconsistency between the players' input and the output of the game character's movement; 2) the gameplay aspect, as this made the purpose of the game very difficult to achieve; 3) the level design aspect, as it would be difficult to test all the options in time to meet the deadline, owing to the breakdown.

This situation forced my group to explore a number of strategies and to add new options for the gameplay aspect, in an effort to reframe the event. Four options were added between 16:00 on the second day and 03:00 on the third day. Some of the programmers worked on these options for different kinds of gameplay, and developed a number of prototype versions to test the options. Similarly, options in the level design aspect were removed, in order to simplify the implementation. The level design could be properly tested only after the movement, and subsequently the gameplay aspects, were further developed and successfully implemented. After working on various prototypes, my group decided to use the chain option for gameplay. At this point the deadline was getting close, and we had to move on with the game development. Thus, the imposed constraint of the time frame accelerated my group's design decisions. We reframed the gameplay aspect, and argued that, despite the inconsistency between the players' input and the output of the game characters' movements, the need for players to practice controlling the movement of the game character, and master it before they could win the game, could add appeal. My group supported this design decision by comparing the game to an existing game, 'QWOP' [7], with a similarly difficult control scheme that the player must master.

In order to be able to reframe the chain option in the gameplay aspect, my group first had to test various options of the movement aspect by creating several digital prototypes. At that point, we focused on the movement aspect, since it negatively influenced other aspects. During the breakdown, options for the gameplay aspect were added, removed, and added back, which reflects how the group reframed the original option by discussing pros and cons, and eventually went with the original option.

5 Discussion

Similar to Biskjaer et al's approach, this study focused on how creativity constraints transformed the design space of the game jam, by using their design space schema format. Biskjaer et al. applies the design space schema format to a longer design process, where a series of experimental prototypes were developed. The notion of design space was applied to the game jam case study and utilised the design space schema format to support the study of the game jam design space. Studying a game jam through the notion of design spaces offers a vocabulary to support analysis of how people create games in the rapid pace of a game jam. The analysis illustrates how aspects and options of a game jam design space are co-dependent and mutually susceptible in a complex interplay. Despite Biskjaer et al's proposed strategies are based on a limited case study, and despite the different situations in their case study and this case study, the findings indicate that different strategies of navigating and transforming a design space were applied in the game jam, similar to Biskjaer et al.'s design space strategies found in design processes. In the section below the findings are compared to the five strategies.

5.1 Strategies in the Game Jam Design Space

The four events described in the previous section encompassed several different strategies that the group used to transform a design space and develop a functional digital game prototype. For the first event, no design space schema was developed, since at this point in time the group mostly discussed vague themes and ideas rather than clear aspects and options. After the theme of drones was agreed upon, the options for a thematic direction for the prospective game were no longer considered, and, was therefore removed from the design space. Furthermore, the overall theme of drones provided a much clearer direction for the discussion of various aspects and options in the design space. Each of the last three events encompassed the strategy of *dynamically adding aspects* as the design process advanced and the group worked on implementing the game in greater detail. After establishing the initial design space, each of the last three events encompassed strategies of *dynamically adding and removing options* during the design process, along with the addition of aspects. Removing options reflected how the group restricted the design space, for example because of breakdowns caused by intrinsic constraints in the game engine, or lack of time until the deadline. The remaining strategies, as identified by Biskjaer et al., include *brainstorming about options for one aspect*, *temporarily ignoring aspects*, and *deciding (perhaps only temporarily) to consider the implications of one aspect with respect to another*. These strategies could also be observed in this case study. Once the initial design space was established, a

recurring strategy was to *temporarily ignore aspects*. Throughout the entire design process, the group shifted its focus among the options for various aspects, omitting other aspects to either add options to, or remove them from the aspects in focus. This suggest a strong connection between the strategy of *temporarily ignoring aspects* and its relationship to how the group *dynamically added and removed options*.

Future studies could focus more on how the format of a game jam shapes how a design space is transformed. Does the design space and strategies change character in a fast-paced game jam, compared to a longer design process? Future research might further study how different game jam formats influence how people work creatively in a game jam, how this influences the design space and what kind of strategies game jam participants apply to accommodate for the rapid pace of the format. Studies of this can potentially improve how we understand game jams as design processes, and support reflected participation in game jams, and support the organisation of them. This aim is in line with contributions of for example Goddard et al., who pursue to develop guidelines for game jam facilitators to support designed experiences and outcomes elicited from designed game jam formats used in research, education, and industry [10].

5.2 Creativity Constraints in the Game Jam Design Space

The notion of creativity constraints, which constitutes design spaces, provides a useful vocabulary of articulating and identifying factors that shape how a game jam as a design space transforms. Recent years, creativity research has turned its focus towards how creative constraints can at the same time limit and open up possibilities for creative processes [2]. Furthermore, it has been argued that insight into constraints can enable practitioners to manipulate constraints to advance their creative process [2]. By gaining insight into what kinds of constraints transforms a design space in game jams, we can improve our understanding of the creative processes happening in game jams and what characterizes this kind of game creation event.

Furthermore, studying creativity constraints and how they shape strategies of navigating game jam design spaces can be a worthwhile pursuit in order to strengthen our understanding of the design processes in game jams. A better understanding of this might support game jammers who wishes to use game jam participation to develop their own design ability, for example by being able to identify and manipulate the constraints encountered in a game jam. Several studies suggest that participating in a game jam to 'learn something' is one of the main reasons for participants to attend game jams [9, 25, 31], especially for younger people [29]. Understanding design processes in game jams, for example by utilising the notion of design space, can potentially support our understanding of what exactly is 'learned' or experienced by game jam participants.

5.3 Limitations

Since no design space schemas were made during the first event, the schema format in their current form might not have been suitable for the early idea generation stages in the rapid pace of the game jam. Making a schema at that point in time was difficult, since many different vague themes and ideas was generated in a short amount of time, in this case in three hours. During those three hours, and until agreement on the theme of drones, the process was as much about aligning expectations and personal preferences regarding the prospective game prototype, as it was about finding a game idea. Though the method utilised other forms of documentation such as audio recordings and photography, the design space schema format alone might not have been optimal for capturing the transformation of the design space of this first idea generation session of an already fast paced game creation event. Further studies using design space schemas can confirm or refute this, as more experience with creating design space schemas during active participation in a game jam possibly might improve findings. Elsewhere, we have experimented with real-time annotation technology to support the documentation of design processes in a game jam setting, using video recordings and distributed annotation among the game jam participants during the design process [26].

As this was a single autobiographical case study, we do not claim the findings are generalizable. Rather, we point towards interesting observations and directions for future research into the inner workings of game jams, including how design space strategies are used to navigate and transform game jam design spaces.

6 Conclusion

In this paper, we present an autobiographical design case study of a game jam, in which the first author both participated as a level designer and a researcher. By conducting autobiographical design in a game jam, the first author got first-hand access to the underlying rationale of the game jam design process: choices made, breakthroughs, challenges, and paths not taken. The case study seeks to shed light on the complex, inner workings of a game jam. In order to do this, the game jam was analysed as a transforming design space, a notion that offers a vocabulary to analyse a design process as a continuous conceptual space of opportunities, opened up and narrowed down by creativity constraints. To support the analysis of the game jams as a transforming design space, the first author created design space schemas during the game jam. The contribution of the case study is the use of the theoretical perspective of design space on game jams, and potential directions for future research into the inner workings of game jams.

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