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AI-Powered Game Design: Experts Employing ChatGPT in the Game Design Process

Michael Lankes

University of Applied Sciences Upper Austria

Andreas Stockl

University of Applied Sciences Upper Austria

Abstract: In today's rapidly evolving gaming industry, there's an increasing need for tools that can aid game designers in creating intricate games within tight schedules. One promising solution lies in artificial intelligence (AI)-assisted game design tools. This research delves into the potential of ChatGPT, an advanced AI language model, in assisting game design experts with specific tasks related to game development. By conducting detailed interviews, we obtained invaluable feedback from experts about their experiences interacting with the model, focusing on the quality and outcomes of those interactions. Our findings not only shed light on the advantages of utilizing AI-driven tools in game design but also highlight the challenges that designers encounter when integrating these tools into their workflow. This study enriches the expanding literature on AI-assisted game design, giving a more profound insight into AI's capabilities and potential in supporting game designers. Our results will be particularly enlightening for game designers, AI enthusiasts, and all those keen on understanding the symbiosis of AI and game design.

Keywords: Artificial intelligence, ChatGPT, Game design

Introduction

Artificial Intelligence (AI) can potentially transform various industries, including the game industry (e.g., Machado et al., 2018; Kreminski et al., 2019; Zhao et al., 2020). Game development is a dynamic and fast-paced environment, where game designers are often challenged to create complex games in a limited amount of time. AI-assisted game design tools have the potential to help game designers overcome these challenges and develop games faster and with greater efficiency (e.g., Araujo et al., 2020; Conroy et al., 2011). With advancements in AI technology, there is an increasing interest in exploring how AI can assist game designers in creating games. AI-assisted game design tools offer several benefits to game designers. These tools can automate repetitive tasks, allowing game designers to focus on more creative aspects. Besides, AI-assisted tools can give game designers new ideas and suggestions for game design elements, such as characters, settings, and storylines. In addition, these tools can help game designers iterate on their designs faster and more effectively, allowing them to make rapid progress on their projects. However, while the technology offers many benefits, it is crucial to understand how well they support game designers in carrying out specific tasks. Knowing how these tools compare to traditional game design methods regarding their effectiveness and efficiency is also essential.

In this study, we explored the use of ChatGPT (OpenAI, 2022), a state-of-the-art AI language model, in supporting game designers in carrying out various game design tasks. The experts were then asked in an interview to provide feedback on their experience using the tool and to evaluate its effectiveness in supporting them in carrying out the tasks. The results of this study provide valuable insights into the use of AI-assisted game design tools and the challenges that game designers face when using these tools. Our findings contribute to the growing body of research on AI-assisted game design and offer a deeper understanding of how AI can

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support game designers in creating games. Furthermore, our results can inform the development of new AI-assisted game design tools that better meet the needs of game designers.

Related Work

The use of AI in game development is a rapidly growing field of research, with numerous studies exploring the potential of AI to support game developers in various aspects, such as game content generation, level design, and game design (Elton Pym, 2020; Riedl & Zook, 2013; Yannakakis, 2012; Politowski & Guéhéneuc, 2021). Game content generation is one area where AI-assisted tools have shown significant promise (Liebana et al., 2019; Togelius et al., 2011; Summerville et al., 2018). Tools, such as AI Dungeon (2019), use AI to generate game content based on player inputs, such as story, dialogue, descriptions, or characters. AI-powered platforms, such as GPT-3, have also been used to generate game content (Sobieszek & Price, 2022; Vartinen et al., 2022; Shakeri et al., 2021). These tools have the potential to free up game developers' time and creativity by taking care of repetitive or time-consuming tasks, enabling them to focus on other aspects of game development (Delarosa et al., 2021; Larsson et al., 2022; Charity et al., 2020; Li & Xing, 2021; Zagal & Tomuru, 2013; Busurkina et al., 2020; Eberhard et al., 2018; Cho et al., 2020). By enabling faster iteration, these tools have increased game design efficiency and creativity. Additionally, they provide valuable resources to game designers, such as assisting them in obtaining feedback from players through game reviews, which could be utilized to improve the overall game design or specific features.

Apart from getting AI-supported feedback, AIs could support game designers regarding game systems and the design and tuning of individual game mechanics. For instance, Machado et al. (2019) evaluate a recommender system for assisting game designers at a junior level that provides recommendations based on frequent itemset data mining algorithms. AI algorithms have also been used to generate game mechanics and rules, such as in the AI Dungeon game engine (2019). These algorithms can create unique and engaging game mechanics that may not have been possible with traditional design methods (Roohi et al., 2020; Paraschos & Koulouriotis, 2023; Horn et al., 2017; Partlan et al., 2021). AI approaches also offer opportunities to support the ideation process for a game design (Treanor et al., 2015). After Kim and Maher (2023), co-creative AI systems in design allow users to collaborate with an AI partner on open-ended creative tasks in the design process that enhance design creativity by inspiring the exploration of novel design solutions in the initial idea generation. Zhu and Luo (2022) propose a generative approach to design ideation that utilizes the fine-tuning mechanism of GPT to leverage knowledge understanding and domain synthesis. Although showing intriguing results, the output may vary in quality. The authors note that the AI system should not be seen as a designer on its own but as an assistant supporting the ideation phase and brainstorming with human designers to boost their creativity. However, the current approaches only investigate design in a general sense. The integration of AI systems that support the creation of innovative ideas and game design concepts has yet to be explored.

In summary, the study of AI-assisted game design is a crucial area of research, as it can revolutionize how games are designed and developed. This study contributes to this research by exploring ChatGPT, a state-of-the-art language model developed by OpenAI (2022), in supporting game design experts in carrying out various game design tasks, including mechanics and game goals.

Approach

The previous section discussed the various ways in which AI can support game design processes. One particular tool, the popular chatbot ChatGPT, has become popular over the last months and has been employed in various domains. Using a tool such as ChatGPT in the context of game design appears to be an interesting field of investigation. By allowing designers to discuss problem areas with the chatbot in a context-sensitive manner, designers can receive interactive feedback on topics such as game mechanics, initial design ideas, and functions of game systems. While the use of AI systems like ChatGPT can be positive, it's important to acknowledge potential negative effects or areas for improvement, such as the possibility of the system providing insufficient or unusable solutions that could negatively impact the game production process. Our work explores the potential of the exchange between game designers and ChatGPT. Specifically, the paper investigates whether current AI chatbots can effectively support designers in specific design tasks, focusing on the professional perspective of game designers who face these challenges daily. To achieve this, the study will guide designers in interacting with ChatGPT and exploring the system's limitations, using frameworks in the form of tasks. The results of these interactions will be discussed in expert interviews. The upcoming sections will describe the essential elements of the study in greater detail. First, the paper will list the tasks that the designers processed and that

served as the basis for the expert interviews. In the subsequent section, the study's procedures will be described in greater detail, along with more information about the participating experts. Finally, the technical description of the analyses will be presented. By providing a comprehensive overview of the study, this paper aims to shed more light on the potential of AI chatbots like ChatGPT to support game design processes.

Task Design

The tasks are based on the results of a previous study, where game designers were asked about the possible applications of AI and game design. During the study, several scenarios or situations were suggested by the experts, which proved to be helpful for the construction of the tasks of the current study. Based on the experts' suggestions, ten tasks were defined. These were sent out to three experts participating in the survey before the start of this study of this paper. The experts were asked to select three of the ten tasks using Google Forms that were most interesting to them. The tasks that received the most votes were selected for this study. The tasks are listed below:

- **Task 1:** You want to design a serious game for older people (70+) to train their memory playfully. Find out what kind of games and mechanics suit this target group. In addition, clarify the length of interaction and the frequency of interaction (frequency of play, repetitions). The question of whether the game should be designed for single or multiplayer should also be considered.
- **Task 2:** You aim to create a tutorial for an action-adventure game (e.g., Uncharted series, Tomb Raider). You want to find out how to build the tutorial so that the players can grasp essential points (objectives, controls, mechanics) in as short a time as possible, and the tutorial is integrated into the game story.
- **Task 3:** You are considering integrating a time limit (countdown) into your turn-based strategy game, so the opponent does not have to wait too long. Find out which games include time limits, whether players rate time limits well in this context, and how such a limit can be integrated (e.g., the timer only becomes visible after a specific time).

Participants & Procedure

We recruited three game designers from the indie game industry to evaluate our approach (two male and one female). Expert 1 (E1) currently deals primarily with system design, while Expert 2 (E2) deals with various topics in game design (e.g., character controls, balancing, pacing). Expert 3 (E3) can already look back on several years of experience in the field of game design, especially in the area of turn-based strategy. All experts were interviewed individually in a remote scenario. The experts received the tasks via mail one week before the interview. In the mail, we asked them to read through the tasks carefully and solve them before the interview date. As an indication of the time required, 20 to 30 minutes per task was given. In addition to the instructions, a link to ChatGPT was also provided. After the experts had completed all tasks and sent the ChatGPT conversation history, an interview appointment was scheduled to discuss the results. After the interviews for the three tasks were completed, the game design experts could provide their views on the potential for AI in their field of activity by discussing the following questions:

- How valuable is using AI tools, such as ChatGPT, in your professional work as a game designer?
- Will you use ChatGPT or a similar tool for your activities?
- How do you see future applications of services like ChatGPT in your career?
- What risks do you see for your field of activity in the context of AI?

After these questions were discussed in detail, the interview ended. All interviews were recorded with the experts' consent and lasted about 60 to 70 minutes.

Results

This section deals with the experts' perceptions of the individual tasks. The qualitative content analysis procedure by Mayring (2004) was utilized to evaluate the survey's open questions and semi-structured interview notes. For this purpose, the choice fell on the inductive category formation approach to obtain the categories for this evaluation method. The questions listed in section *Participants and Procedure* were employed, which shall provide insights into the potential of ChatGPT to support experts in solving game design tasks. In addition, the experts describe their assessments of the implications of using AI in general in their field of activity.

For the evaluation, we used video recordings of the interviews with the game designers. The individual interviews are between 32 and 38 minutes, resulting in a total of about 108 minutes of material. For evaluation, it was necessary to have the content in text form. Therefore, as a first step, it was required to transcribe the recordings. Since manual transcription means a very high expenditure, a machine procedure was used. The method can also be scaled to more extensive data volumes. A recent paper (Radford et al., 2022) presented a new method, including open-source software, that produces a shallow error rate comparable to human transcription. The model “OpenAI Whisper” is a robust multilingual speech recognizer consisting of a neural network according to the Transformer architecture (Vaswani et al., 2017) trained on 680,000 hours of audio. We used the “large” version, which promises the most accurate results but requires powerful hardware with GPU support to obtain usable transcription times. We ended up with text files with an average length of 12,522 characters. In the following, we report our findings separately for the different tasks.

Task Design General Impression

When reviewing the interview data, it became apparent that each expert had something positive to say about using AI in game design. For instance, E1 explains that AI tools help him save time and energy by helping him gather and structure information (E1: “I don't have to do some research because ChatGPT already provides patterns. I pick two approaches out of eight and can work with them because they fit my concrete problem very well, and it saves time.”). E02 mentions that AI could be used in many areas, including groundwork, tossing ideas back and forth, localization, defining keyframes, text production, and balancing. He and his team want to try out the ChatGPT tool to see how they can tie it into the production process. E2 considers the strengths of AI in areas where the designer defines the essential points. The AI closes the gaps (E2: “...if you as a designer define the key points, the most important points, if you transfer it to animation, the keyframes, and the system interpolates in between, so to speak, or how can you imagine that? Exactly, so I think that will help me a lot, especially when it comes to writing designs, that just much faster and much easier and more pleasant for me to communicate to people”). Like E2, E3 believes tools like ChatGPT can be valuable for generating ideas and serve as a starting point.

However, not only positive things were mentioned. The risks of AI in the game design field and for game development, in general, were also discussed: For instance, E01 emphasizes that it is essential to be aware that third parties can control AI systems, so one should only rely on them a little. Furthermore, E01 states that AI systems need to be critiqued, as one would do with input from another designer (E1: “For me, the program is a design colleague, an assistant that reminds you of things, that maybe sometimes even corrects you if there's a mistake if you've remembered it wrong or whatever, so it's an assistance system that has contextual knowledge. But colleagues can also make errors”). E3 also mentions that there are also risks, such as the danger that AI-based programs could replace jobs and entail legal issues (E3: “I think that's just about the biggest problem I see with it in professional use. This probably has nothing to do with the tool itself but simply that the terms of use are too unclear.”). E3 also sees the need for humans to be able to control AI and judge artistic representation. Besides, E3 is open to using such tools in his work and thinks it's great that such technologies are being researched (E3: “We've already joked with the design team that we'll somehow generate some story with it and then move away from that. So yes, I think these basic ideas and suggestions are really interesting that you can probably get from them.”).

Task Design Task 1: Game Design for Elderly People

When evaluating ChatGPT concerning Task 1, the experts had several points of criticism. Although the chatbot supported them in the task, they saw the potential for improvement on several levels. For instance, E03 noted that she had to dig deeper into specific areas to get the correct and satisfying answer (E3: “The text is then simply iterated, i.e., you ask for something, and ChatGPT then actually just tries to put somehow what has already been said into another form. That was a little bit of strange.”). E2 noted that ChatGPT could not provide expert knowledge, but the system did assist him in completing the tasks (E2: “I wouldn't call it expert knowledge. ChatGPT has not played any games. It is purely based on text. To be an expert, you must have played the games, at least in my opinion.”). E02 also envisioned a research project combining image generators with text adventures to see what emerges.

Another interesting observation was that E1 had not expected that he would get the ultimate answer for the target audience (E1: “Some of the input didn't fit - honestly, that's what I assumed. You must think for yourself just as much as if you get feedback from someone. That's why it was mixed in terms of my impression of how

helpful it was.”). E1 also had the impression that the AI was careful regarding its formulations and did not try to present the ultimate solution.

However, E1 saw this aspect as something positive by mentioning: “This is also the case when we analyze and discuss concepts internally and compare new concepts with old concepts because we are aware that just because something has worked in the past does not mean it will work the same way for the new concept.” Besides, E1 thought he had to look critically at the results and see if they fit his use case. In general, the experts also identified some positive aspects: E2 found completing the requirements fun and answered the game design questions with three suggestions provided by the chatbot. Besides, E03 mentioned that the ChatGPT could give the details in some cases when needed. E03 also noted that he received surprising responses concerning game design suggestions, including a progression system that she had not expected.

Task Design Task 2: Tutorial for Action-Adventure Game

As with task 1, there were several positive and negative points. According to E1, ChatGPT helped him complete the task by providing him with several solution strategies. E01 picked out specific points to obtain more information on the given task. However, E1 noted that it is not easy to come up with a solution in design work within the given task (E1: “I didn't expect in advance that I would now get the ultimate answer as to the ideal result for this target group. And that was not the case. And I think that has to do with the fact that our work is primarily creative.”). Besides, he notes that ChatGPT needs to be careful about suggestions because not everything that works in the provided examples will apply to Task 2 (E2: “That's also the case when we analyze and discuss any concepts internally and compare new concepts with old ones because it's just conscious. Just because it worked now in the past doesn't mean that it will work the same for the new concept.”). E2 also mentioned some positive aspects by stating that the ChatGPT helped him solve the task by providing him with a checklist to cover the basics. E2 noted that he was surprised at how much knowledge the system provided and that he might try it for his next game. The expert also said that he would have found it interesting if he could have seen a game to get more concrete suggestions for the tutorial (E2: “It would have been interesting if I had seen a game, an adventure game. If I could somehow feed the game or the rules of the game and if he could then give me more specific suggestions for the tutorial. That would be interesting. But I don't know if that wouldn't eat up too much time and effort as opposed to just doing it myself.”). E3 was rather negative about the outcome of task 2. She felt ChatGPT did not help her complete the task because it needed to be more specific and address the requirements of the task (E3: “I think that that was a bit too general for me; probably a relatively good starting point, but where you would then have to do further research yourself and would then have to consider how something like that could look.”). Furthermore, the expert got some results that confused him (E3: “You ask I want a tutorial that integrates well with the story, and then ChatGPT suggests that you should make the tutorial so that it integrates with the story.”) In general, she felt that the knowledge gained was limited in this form.

Task Design Task 3: Timers in Games

In this task, the experts were relatively positive about the results obtained with ChatGPT. According to E1, ChatGPT was helpful and provided suggestions based on specific examples. Like E1, E2 felt that ChatGPT assisted with this task and would even go so far as to say that he would now do the actual design and continue working on it. He explained that ChatGPT saves a lot of research and writing time (E2: “The program saves tedious work. Yes, or it's also very effective for brainstorming because I've talked to ChatGPT, for example, where I somehow designed a city planning game just for fun.”). However, E2 remarks that designers still must follow up and correct certain things because ChatGPT doesn't know everything and sometimes makes mistakes (E2: “But now I have noticed that you can't believe everything the program says. Sometimes there is an error in it, or it just does not know everything. You always have to check and correct now and then.”). Besides, E2 was surprised that ChatGPT told him something he didn't already know (E2: “It also surprised me because, for example, the mechanics of Advanced Wars, which ChatGPT listed, I didn't know at all, or the game in general.”). Overall, the E2 was delighted with the outcome and felt it was a time saver. As in the previous task, the experts identified several negative aspects: E1 notes that the tool was agnostic and did not provide an ultimate solution to the problem (E1: “Because the AI then gave a concrete example of a game in which this and that was good. And when I then ask about it, the AI suddenly becomes very cautious again and says, yes, of course, you can't say that unequivocally. ChatGPT then tried to justify itself. That also sounds so funny.”). E1 was surprised by the level of detail and specificity in the tool's responses but noted that it was cautious in its suggestions and did not make any definitive claims. The conversation touches on the limitations of the tool's

suggestions and the speaker's uncertainty about adopting the tool's recommendations in a professional setting. E3 mentions that ChatGPT provided a good overview in completing the task, but there were problems in the implementation. The expert thinks it did not go deep enough to understand how to integrate timers into a game to avoid discouraging players (E3: "There are also players who are really put off by timers. So, where it goes in the direction of the game with a timer, they would not play it. ChatGPT indicated some players might feel pressured by a timer. It can be problematic that people don't want that. That's where the program could have gone more in-depth."). Overall, E3 feels the information was rather superficial, and there could have been more concrete game situations to understand how to use timers effectively.

Discussion

One of the critiques expressed by the experts was that the exchange lacked depth in terms of content, and they wanted more detailed information on specific issues. The experts suggested that some of the recommendations made by ChatGPT could have been more precise and provided more profound insights into particular topic areas. In addition, the program was hesitant to commit fully to specific proposals, even when prompted by one of the experts to provide more detailed answers. This led one of the experts to infer that ChatGPT may have intentionally imposed restrictions in certain areas.

Despite these criticisms, there were also positive aspects of the exchange that surprised the experts. For instance, the program encouraged experimentation when one of the experts used ChatGPT for game design, which provided a basis for the expert's work. The experts agreed that the program was a good foundation for further design work and could positively impact the development of game design ideas. However, none of the experts provided a purely positive evaluation of the results, and E3 summarized the situation by noting that ChatGPT tended to focus more on the positive rather than the negative aspects of the responses.

In conclusion, there were both positive and negative aspects to the interaction. The experts' criticism of the lack of depth in content and ChatGPT's tendency to repeat certain statements may have limited the effectiveness of the exchange. However, the experts noted the program's encouragement of experimentation and ability to provide a good foundation for further design work. Therefore, it can be concluded that the exchange was a mixed success with strengths and weaknesses that should be considered in future interactions.

ChatGPT as a Fellow Game Designer

During the implementation phase, it was observed that the experts began attributing human-like qualities or behaviors to the program, which is not uncommon in the field of interactions with AIs (Reeves & Nass, 1996). This phenomenon was evidenced in several instances. For instance, E1 expressed that he sometimes felt that the chatbot was cautious about providing specific recommendations for fear of being proven wrong. He explained that he found it somewhat eerie that he was beginning to think of the program as a person. As he continued to work through the tasks, he started to view ChatGPT as a work colleague, a game designer who assisted him with specific problems. E1 even mentioned that he communicated with the program in a way that was similar to how he interacted with other work colleagues. This interaction aspect stood out to E1 and was revisited several times during the interview.

E2 also exhibited a similar tendency to attribute human qualities to the program. While he frequently referred to the chatbot as a design tool, he also called it an AI designer and assigned anthropomorphic pronouns such as "he" to the program. E2 also used adjectives such as "smart" to describe the program, a characteristic often associated with humans. E3 also had a comparable impression when she remarked during the interview that she was eager to experiment with the new chat designer. This further supports the idea that the experts viewed the program as a human-like entity.

This tendency to anthropomorphize the program has been studied in the field of human-AI interaction and is a well-documented phenomenon (Salles et al., 2020; Li et al., 2021; Sung et al., 2021; Troshani et al., 2021). Anthropomorphism refers to the attribution of human-like characteristics to non-human entities. It is often observed in interactions with AIs, where users may unconsciously assign human traits to the program. This may be since humans have a natural inclination to perceive and interpret things in anthropomorphic terms. This phenomenon can be advantageous in human-AI interactions as it helps to establish a more natural and engaging connection with the program. However, it can also have negative consequences, such as unrealistic expectations of the AI's capabilities or a distorted perception of its limitations.

The Future of AI-Powered Game Design

The experts who participated in the study were optimistic about future use cases of AI technologies in the game development industry. They believed that AI technologies would revolutionize the industry by providing innovative and efficient solutions to many of the challenges game designers face. One area where AI could be beneficial is the conceptual phase of game development. AI technologies could help designers by filling in the content gaps in their initial ideas, allowing them to focus on the critical aspects of the game. Additionally, AI could simplify the time-consuming process of formulating and updating game design documents, freeing designers to focus on other parts of the development process. The experts also noted that AI could be useful in researching specific target groups or game mechanics, allowing designers better to understand the needs and preferences of their intended audience. AI could also be used to compile game reviews of existing games, providing designers with valuable insights and recommendations for new designs. Another area where AI could be highly beneficial is in defining and balancing complex game systems, such as strategy games. By allowing the designer to define the framework and letting AI handle the time-consuming details, designers could save significant amounts of time and effort. AI could also present complex and large amounts of data efficiently and in an easily understandable way, facilitating design decisions and speeding up the development process. In sum, the experts saw many potential future applications for AI technologies in game development. They believe these technologies will play a significant role in transforming the industry in the coming years.

Limitations

The discussion of the interviews and analysis conducted in the study provides valuable insights into the intersection of game design and AI. However, it is essential to acknowledge that the study has some limitations that must be considered. One of the main limitations is that the study only focuses on a limited set of tasks, as the experts processed only three tasks to manage the workload of game designers. These tasks primarily deal with conceptual aspects or relatively clearly defined topics. Future studies should consider including other elements, such as game development's production and post-production phases. This would allow for a more comprehensive understanding of how AI can support game design, including relevant topics like balancing game systems and interpreting playtests. Moreover, it is worth noting that there are overlapping topics between different departments involved in game development, such as game design, programming, and game art. Exploring how these various departments can work together to achieve a specific goal, such as realizing a particular game mechanic, would provide valuable insights into the game development process. Another significant limitation is the rapidly evolving nature of AI research, which can make technology quickly become obsolete or improved. As the study uses ChatGPT to enrich work processes in game design, it is crucial to recognize its limitations. The experts identified some weaknesses in ChatGPT, such as more content depth in recommendations to extract concrete action instructions. However, the game designers believe that these issues will be addressed in the future, and AI will radically change the game development process.

Conclusions

In conclusion, this paper explored the potential of the exchange between game designers and ChatGPT, investigating whether current AI chatbots can effectively support designers in specific design tasks. While ChatGPT and the experts held different views on the exchange quality, several positive aspects were mentioned. The experts noted the program's encouragement of experimentation and its ability to provide a good foundation for further design work. However, the experts criticized ChatGPT's tendency to repeat certain statements and the lack of depth in content. It was also quite interesting that the experts also tended to anthropomorphize the program, attributing human-like qualities to it. In sum, the experts believe that AI technologies have the potential to revolutionize the game development industry, particularly in the conceptual phase of game development. The results so far encourage us to look even deeper into the topic. Thus, we plan to include other game design tasks in future studies that deal with production processes over a more extended period. The players' involvement in the game design process, which an AI moderates, proves to be an exciting field of research.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPSTEM journal belongs to the authors.

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Author Information

Michael Lankes

University of Applied Sciences Upper Austria
Softwarepark 11, 4232 Hagenberg, Austria

Andreas Stockl

University of Applied Sciences Upper Austria
Softwarepark 11, 4232 Hagenberg, Austria
Contact e-mail: Andreas.stoeckl@fh-hagenberg.at

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