

Product vision

Introduction

The basis of activities is laid out in the product vision. It is very important every party can fully recognize themselves in what is written; even though it might be the case that the product deviates from it slightly in the course of the project. The product vision sheds light on the goal everyone shares and the interests of the different parties. It also helps the Scrum team along in the working process.

The product will be a tool to aid a city planning software from a company named Tygron. This software allows cooperation between different parties involved in the process of city planning. Different stakeholders come together in sessions in order to plan out the future of certain geographical locations using said software.

The task at hand is to replace the municipality (the stakeholder) with Artificial Intelligence. This would eliminate the need for said party to be present in order to conduct a session. However, this requires the Artificial Intelligence to behave as the municipality of the geographical location, which is the TU area.

In the remainder of the document the following will be discussed: First of all, the target customer for the product will be described. Next, the needs of the customer will be addressed. Furthermore, not all of the customer needs can be satisfied. This means some of the customer needs need to be prioritized as crucial in order for the product to succeed. After that the product will be compared with other existing products and the selling points of the product will be explained. And finally in how much time the product should be finished as well as how much money will be available to create the product.

Who is going to buy the product? Who is the target customer?

The client which requires the specific product is Tygron, a company which has built an urban city planning serious game. Tygron normally tests their game in sessions using humans. But the company started to show interest into stakeholders represented by Artificial Intelligence. This can be quite useful for, for example, newcomers to the Tygron Engine, who are not yet familiar with the program. The product can then take over a stakeholder and while the simulation runs, the user can see possible operations that can be initiated in the program.

Other than the main customer Tygron, there can also be other companies who want to substitute human players for Artificial Intelligence and might also be interested in the product. This may especially be true for companies who also specialize in city building games.

Which customer needs will the product address?

The software Tygron has provided a simulation program. During a session, the different stakeholders are each provided with their own perspective and can perform actions with their

interests in mind. At this moment, a party needs all other parties to be present in order to cooperate and respond to their ideas and proposals. This product allows the municipality party to be replaced correctly with an Artificial Intelligence.

There are several other (non-functional) needs which can be satisfied more easily by replacing human entities with Artificial Intelligence. First of is availability. Real humans are not always available for a planning session. This can be the case when the different parties live in different time zones, which would make it hard to set a time to negotiate. This just makes the time available more significant, which leads to the next advantage.

Second, AI can assist you in automated testing of certain parts of the system as opposed to carrying out scenarios purely by hand. This has tremendous advantages in costs and time. In general, not only concerning testing, an AI in general is cheaper than its human competitor.

Third, the AI can use software under development. This makes sessions during which experimental versions of the Tygron Engine playable. Without the AI, there might not be enough parties with knowledge of the changed features of the version. This also again relates to testability of their engine.

Apart from the AI, it is essential to address the need for proper documentation concerning the AI. The client needs to be aware of how to flexibly use the software provided for them. Furthermore, the client can easily see from the documentation all the features the product has implemented.

Which product attributes are crucial to satisfy the selected needs, and therefore the success of the product?

The most important aspect of the Artificial Intelligence is that it realistically represents the stakeholder. The AI must be able to represent the interests of the stakeholder properly in order to reach its own goals. It is very important to account for all interests of the represented stakeholder. The AI must determine how it values each one and how they relate to each other.

The software given by Tygron is meant to facilitate cooperation between different parties. The simulated stakeholder should work in a cooperative spirit with the other parties. This means it should make concessions or propose alternatives in order to properly negotiate (Weiss, 1999, p. 104). However, if there are better solutions for the simulated stakeholder, then it should at the very least try to negotiate a better deal than the one that is on the table. In the end, the agent/stakeholder should always try to prioritize his goals above the goals of other stakeholders. This means that there should also be an element of competition in the agent. These concepts (cooperation, negotiation, competition) are some examples of the functional requirements for agents in a multi-agent system, as published in Silva et al. (2009).

Another example of these concepts is interaction. Interaction between agents is of great importance as city building is a process that requires a lot of communication and consultation. Therefore, it is necessary that a well defined way of communication between the agents is developed with utmost care (Ferber, 1999).

Besides interaction between the agents, proper interaction between the AI and the Tygron Engine is also essential. The AI connects through the connector that is developed independently from the Artificial Intelligence. The connector depends on the Tygron-SDK that connects with the API of the Tygron Engine to retrieve data from the Tygron Engine servers. The SDK is developed by Tygron itself. It is important to notice that further development of the connector may also be needed (and probably is needed) to improve the function of our agents in the Tygron Engine

How does the product compare against existing products, both from competitors and the same company? What are the product's unique selling points?

Tygron has already implemented very basic placeholder stakeholders. In the Tygron Engine, these are the so called 'non playable characters'. These are very basic entities which behave in a very agreeable manner during negotiations. They are very different from the product. One difference is the complexity of the AI between the non player character and the agent. The product has to actually decide between different actions in order to fulfill his indicators, while the non playable character does not have a specific goal it needs to fulfill. The non playable character only agrees with the stakeholder that makes the request. There is also a difference in deployment. Any stakeholder can be replaced with a non playable character, while the product can only act as the municipality.

The unique selling points of the product is that it simulates a real human while performing the designated task of representing a municipality in a city planning environment. Furthermore, the connector of the product gives the advantage that in future projects more actions can be easily added and the product can be adapted to use these new actions.

There are no direct competitors competing with the product. But there are other frameworks that are mentionable. For one there is a relatively old approach which uses an expert system to handle urban planning (Tanic, 1986). Kamal Jain and Payal (2011) have mentioned other approaches in their paper. They mention intelligent agents, which is very similar to what we use in our product. They also mention Cellular Automata and Neural Networks. Cellular automata, according to them, are impractical for accommodating the complex process that involve urban planning. They find intelligent agents a better approach, but it has a shortcoming. An agent needs man-made rules and it is a complex task to create it. Neural network approaches could be used to extend an agent to make it work more generally and needs less effort from an expert, which is supported by Feng et al. (1999).

What is the target timeframe and budget to develop and launch the product?

The timeframe for completion of the product is roughly ten weeks. These ten weeks involve the following things: creating a scenario in the Tygron Engine involving different roles, developing an AI that controls one of those roles and adding functionality to the Tygron

Environment to improve the development of our AI. In this timeframe there will also be a few available contact hours with the client Tygron to ask questions and work together with the other context groups.

The budget and compensation are both non-existent in the form of money.

In order to develop and launch the agents, a programming language named GOAL is used. GOAL is an agent programming language developed by the TU Delft. GOAL uses the high level language Prolog to define rational agents (Hindriks, 2009). One of the ways to develop (and launch) the code programmed in the GOAL language, is by using the stand-alone GOAL integrated development environment. Another way to develop and run GOAL code is using a plugin developed for the Eclipse IDE. Also, you'll need a license for the Tygron Engine to make use of it. Without a license for the engine, you'll not be able to create and start the city planning sessions to develop and run the agent.

Bibliography

- Feng S., & Xu L. (1999). Hybrid Artificial Intelligence Approach to Urban Planning. *Expert Systems*, 16(4), 248-261.
- Ferber, J. (1999). *Multi-Agent System: An Introduction to Distributed Artificial Intelligence*. Harlow: Addison Wesley Longman.
- Hindriks, K.V. (2009). Programming Rational Agents in GOAL. In R.H. Bordini, M. Dastani, J. Dix and A. El Fallah Seghrouchni (eds.), *Multi-Agent Programming* (pp.119-157) New York, NY: Springer-Verlag US.
- Kamal, J., & Payal (2011). A Review Study On Urban Planning & Artificial Intelligence. *International Journal of Soft Computing and Engineering*, 1(5), 101-104.
- Shehory, O., & Sturm, A. (2014). *Agent-Oriented Software Engineering*. Berlin, Heidelberg: Springer.
- Silva, C., Pinto, R., Castro, J., & Tedesco, P. (2003). Requirements for Multi-Agent Systems. In L.E.G Martins and X. Franch (eds.), *Anais do WER03 - Workshop em Engenharia de Requisitos* (pp. 78-92). Piracicaba-SP, Brasil: [n.p.]
- Tanic, E. (1986). Urban Planning And Artificial Intelligence: THE URBYS SYSTEM. *Computers, Environment and Urban Systems*, 10(3/4), 135-146.
- Weiss, G. (1999). *Multiagent Systems: A Modern Approach to Distributed Artificial Intelligence*. Cambridge, Massachusetts: The MIT Press.