The PainTimer Design Process: Research and Development of Applying State of the Art Technologies in Theatre and Performing Arts.

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The goal of this bachelor assignment was to investigate and explore the possibilities of using emergent and future technologies within small to medium-sized (SME) theatre companies and performance arts. Currently, major theatre companies implement various novel and high-end technologies in their productions and shows. However, small theatres in comparison often operate within limited budgets and therefore cannot afford and/or have access to these technologies.

The outcome of this assignment was to create, ideate, and explore possible affordable solutions for small theatre companies that are both efficient and effective, congruously based on a low-cost high-value strategy. The effectiveness in this case means that the technology improves the performance quality, enhance stage presence and enriches the experience of theatre productions.

An existing musical, *Spring Awakening* (Sater, 2006) was implemented as a case study and script, to generate possible solutions. The result of the iterative design process is 'The PainTimer' (TPT): a device which helps theatre performers to time the moment in which they should act to be in pain. During substantial phases of the design process, external input on interdisciplinary creative processes and performativity was in collaboration with Mr. Joris Weijdom from the University of Arts Utrecht (HKU).

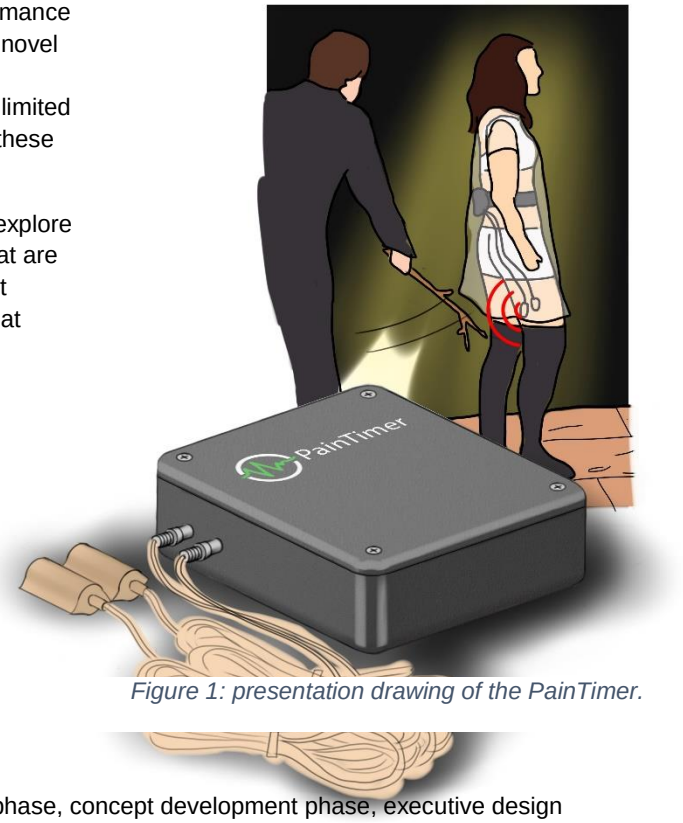

Figure 1: presentation drawing of the PainTimer.

The design process was structured in phases: the ideation phase, concept development phase, executive design phase, final product phase and (re-)presentation phase.

Ideation

To design and develop possible solutions from identified requirements and constraints, the field of action was studied first through literature studies, a market analysis and surveys amongst other things. During the research, a list of requirements was made and an ideation could take place. In the ideation phase, the case study of *Spring Awakening* helped with generating ideas. Three valuable ideas were taken into the next phase of the concept development. One of these ideas would eventually become TPT. This idea was inspired by Act 1, Scene 8, in which one character, Melchior, hits the other, Wendla, with a twig repeatedly.

Concept development

The three ideas were made into concepts with the help of morphological overviews. These concepts were then evaluated through low resolution prototypes and testing them to the list of requirements. TPT was chosen and adapted further by reviewing multiple possibilities of how it could work and doing tests on the timing of real pain. A first version was then designed, prototyped and reviewed.

Final product

The final version of 'TPT' is a device consisting of multiple parts (Figure 2):

1. A plastic casing, containing the power source and a micro Arduino with programmed software installed. This casing can be put inside a belt, worn underneath the clothes of the performer.

2. Separate unit 1, containing a Hall Effect sensor: a sensor which responds to the presence of a magnet. This unit is skin-colored and connected to the casing with wire. It can be put anywhere on the performer's body.
3. Separate unit 2, containing a vibration motor. It is put in a similar casing as unit 1 and can also be put anywhere on the performer's body.

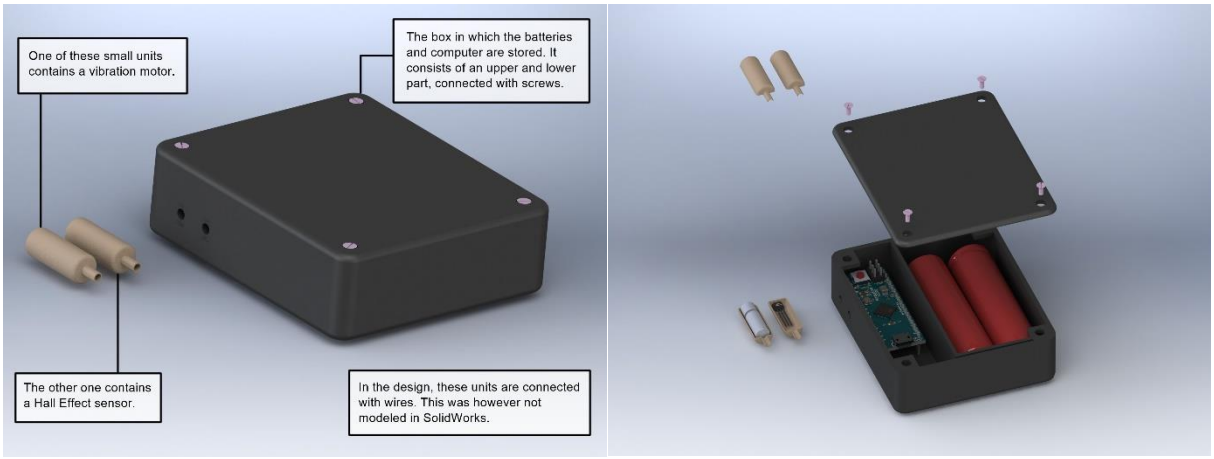

Figure 2: 'TPT' as modeled in SolidWorks.

'TPT' is used in Act 1, Scene 8 as follows: Melchior's twig contains a magnet. When Melchior "hits" Wendla, the twig approaches Wendla's leg. The Hall Effect sensor senses the magnet and a sign is given to the vibration motor (Figure 3). Wendla's performer can then react to the vibration as if she is feeling pain. The process can be repeated as many times as desired.

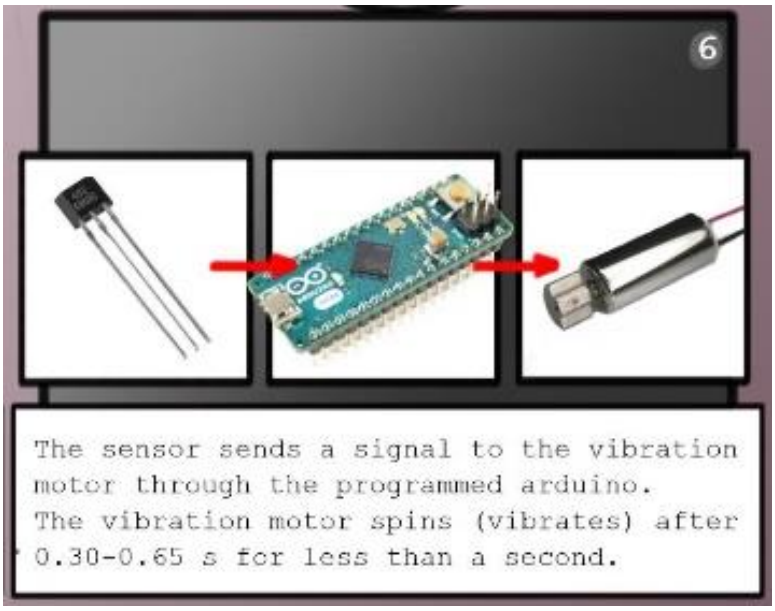

Figure 3: the journey of the signal of TPT from the Hall Effect sensor, through the Arduino, to the vibration motor.

Conclusion

In the last phase, it was concluded that 'TPT' meets most requirements. However, there needs to be more research on how to prevent errors, whether the Hall Effect sensor should be one with digital or analog output and how the performers should be instructed to use 'TPT'. The design fits within the budget of SME theatre companies, however, it might also be suitable for larger companies also, since timing while keeping the illusion alive is essential in their performances as well. The most important recommendation for the design is to do research on more types of timing problems in theatre. In this way, 'TPT' can become a 'TheatreTimer', designed for multiple situations in which timing is essential during performances.

References

Sater, S. (2006). *Spring Awakening* (D. Cohen, Trans.). New York: Theatre Communications Group Inc.