Redesign of a backpack-computer for a serious gaming virtual reality system

Graduation Assignment Industrial Design
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April 2017

Re-lion

This report discusses the results of an assignment commissioned by Re-lion. Re-lion is a tech company developing professional simulations for training and educational purposes, amongst other things using 'serious gaming'(M. Steenbeke, 2007). Their current line of products contains a system called Small Unit Immersive Trainer (SUIT), a mobile training system with which scenarios can be simulated in virtual reality (VR). This allows users to practice as a team in a more realistic way and prepare for crisis situations. An important part of SUIT is the SUIT Box, a computer that is worn on the back, also called backpack-computer. To be able to deliver up-to-date and optimal performance, Re-lion wants to redesign the backpack-computer.

Goal

The goal of this assignment was to develop a new prototype backpack-computer to replace the current backpack-computer, with a focus on optimization of (graphic) processing power and efficient use of energy resources. Points of concern were heat production of the system, the relevant European legislation (CE mark, *Conformité Européenne*) and withstanding environmental factors like moisture, dust and debris.

Approach

To understand the given requirements and learn from previous builds and experience, the current system was analyzed and desk research was done on VR and the involved technologies. This helped creating guidelines for further (market) research and setting up the program of requirements (POR). Using this knowledge, a more precise direction was chosen in the research on technology involved in SUIT and specifically on technology needed in the backpack-computer. This brought forth possible component configurations and suitable computer systems. To gain knowledge on cooling, electromagnetic compatibility and ruggedizing systems, special attention went to these subjects as well, bringing forth possible solutions.

Using the POR, several hypothetical computer systems were composed for use as a backpack-computer. A mini ITX motherboard based system with a dedicated graphics card was found to be the most suitable solution at that moment. Subsequently, several design steps were performed, starting

with the general composition of components, followed by the rough design of the airflow, specific composition of components and the rough design of the casing. During the final design phase the results of the previous steps and several solutions were combined into a design proposal.

Results

The final design solves most of the important problems regarding the use of a mini ITX motherboard with a dedicated graphics card. A CAD model however, is not provided for such detail was not yet achieved during the final design phase. Several smaller problems which are described in the recommendation section call for a solution still. The final results do provide a plan with sufficient detail for eventual transition to a CAD Model and a functional prototype . Also the results of the research can be used for future decisions.

Conclusion and recommendations

The goal of the assignment of designing and building a prototype is not completely met. The total extent of the assignment and the desired level of detail proved to be too much in combination with the prolonged analysis phase. However, the results could still prove useful. When doing a follow up, market research into the latest technical developments might be useful and reconsideration of the ready-to-use or barebone VR backpack computers is recommended. For further development of a mini ITX motherboard based system, more specific recommendations are stated in the recommendation section of the full report.