DriVR - Vehicle controlled with help of virtual reality head-mounted display

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Extended Abstract

The concept of virtual reality has been known for several decades, despite the fact that public began to be more interested in this technology after the year 1990. Many years gone by since then and technology advanced by leaps and bounds. Nowadays virtual reality is interpreted as computer simulated environment, which simulates physical presence in virtual or real world. Simulated presence in real world environment has wide range of utilization and it is important to focus on this area.

Our proposed approach, which represents images of the real world as 3D environment in virtual reality device, has many advantages. These advantages predetermine this approach to be successful in various areas, for example science, military equipment, entertainment industry, rescue missions and many more.

This solution can enhance operator's spatial awareness, simplify control of vehicle and provide 3D image of inaccessible space for operator as if he was actually there. These days scientists at Carnegie Mellon University work on a project with an attempt to land on the Moon using remotely controlled vehicle and the Oculus Rift [1].

The aim of the project is to create remote controlled self-powered model of vehicle operated with help of virtual reality device. Figure 1 roughly describes our solution.

The *vehicle* is equipped with two moveable cameras which are used to capture stereoscopic image required for binocular vision. The images from both cameras have to be synchronized. The vehicle receives control commands from base station. Control commands are processed by single-board computer Raspberry Pi which determines the direction of vehicle and cameras. The vehicle also transmits compressed video data and optionally sensory data. WiFi is used for wireless communication in both directions.

User wears the Oculus Rift *virtual reality head-mounted display*, which displays processed 3D image from both cameras. By moving his head the user controls the position of both cameras simultaneously. The direction of vehicle is controlled with gamepad. We have used gamepad from XBOX 360.

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The *base station* is the central point of the system. It processes and evaluates all the data. It transforms signals from control devices to signals for control of the vehicle. It receives a processes the video data from cameras. Base station renders split-screen stereo image with distortion correction for each eye to cancel the distortion due to lenses. This is required by Oculus Rift [2].

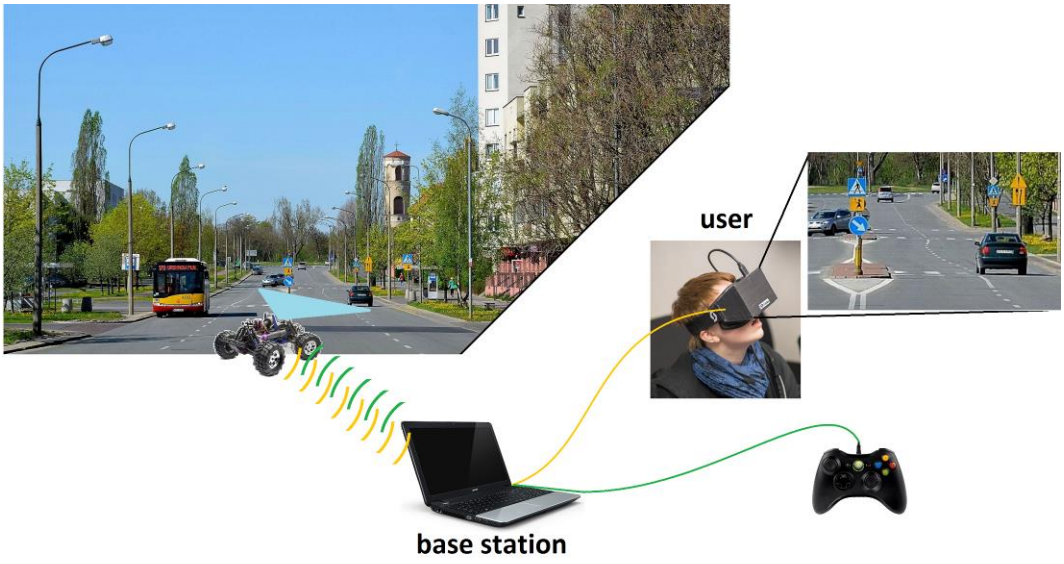

Figure 1. Main components of DriVR

All in all the project aims to provide easier control of vehicle and enhance operators spatial awareness. In addition to a number of previously mentioned areas of application, contact with new and perspective technologies is also an important contribution of the project. For example Oculus Rift device, which is used, has not been officially released on the market yet. Moreover the connection of a virtual reality with material world is very interesting. Finally, a lot of students interested in this area of education, will have available documentations about project and they will be able to extend this project to other functions, such as adding augmented reality features.

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References

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