SOUTH DAKOTA SCHOOL OF MINES & TECHNOLOGY

Research and Development of a Low-cost, Open-source, Highly-accessible Telepresence System

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Introduction

Virtual reality:

- Now available to anyone with a smartphone and $20

Telepresence systems:

- Enable physical presence through technology
- Enterprise solutions are expensive

Despite available technology, no open-source or low-cost VR telepresence projects exist in the robotics ecosystem!

- Wide potential for educational institutions and businesses

Objectives

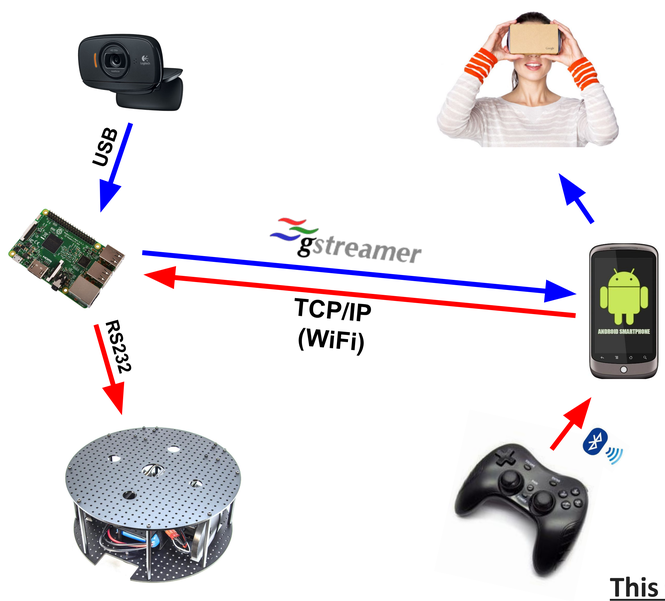
1. **Investigate the feasibility of a phone-based, internet-connected telepresence system built with community-supported hardware and open-source software**
2. **If possible, construct a prototype to prove the concept**

Hardware

- **Trossen Robotics Geekbot**
  - Provides mobile base, battery, Arduino MCU
- **Raspberry Pi 3**
- **USB Webcams**
- **Custom Camera Gimbal**
  - 3D printed, hobby servos
- **Google Cardboard + Bluetooth Controller**

Software

- **Android OS + Android Studio**
  - 80% of market share globally
- **GStreamer**
  - Low latency video, Android SDK
- **Arduino IDE**
- **Debian Jessie**



Results

Determined that it is possible to construct a low-cost VR telepresence system using existing community-supported hardware and software:

- Total cost : ~$400
- All software available at no charge
- Custom designs and software available online

Constructed a functional proof-of-concept prototype:

- Remote control and video stream from anywhere in the world!

Future Work

- **Cellular network capability for WiFi-averse environments and greater mobile range**
- **Complete and feature-filled Android app**
- **Develop and provide "download and go" OS images and GUI front ends for software**

Acknowledgements

A big thanks to Dr. Montoya for heading the ECE REU this summer, Dr. Hoover for his guidance and support, Dr. McGough for providing lab space and hardware, and Dr. Boysen for keeping us all on track to excel.

This work was made possible by the National Science Foundation REU Site: Bringing Us Together, Improving Communications and Lives (Award Number EEC-1359476)