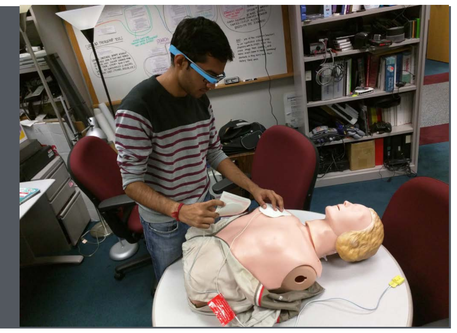
A Wearable Cognitive Assistant for Operating AED Machines

Toby Jia-Jun Li, Jineet Doshi and Rui Silva Mentors: Siyan Zhao and Junjue Wang
School of Computer Science, Carnegie Mellon University



Introduction

Prior study has shown that the paper manual is ineffective in guiding novice users to correctly use the Automatic External Defibrillator (AED) machine.

In this poster, we present a wearable cognitive assistant running on Google Glass that assists the users in using an AED machine.

Our system interacts with the user through a conversational interface. It leverages state-of-the art computer vision and deep learning techniques to recognize the current state of the AED operation process, detect errors made by the user, and provide real-time guidance and corrective feedback to ensure the correct operation of the AED machine.

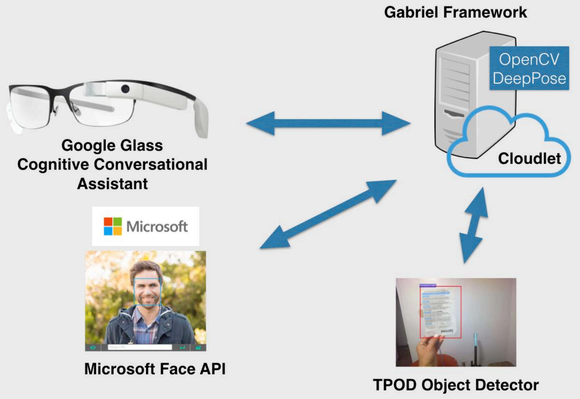
Problems Solved

Operating an AED machine can be hard. The paper manual that comes with it is long and can be cumbersome to read in high-stress scenarios. Our wearable cognitive assistant helps the users in some of the most error-prone steps:

- Selecting the **right pad** (adult vs. children)
- **Peeling off** the pad label
- **Correct placement** of the pads on the right location

Errors in the steps above may result in serious consequences, like death or paralysis.

System Architecture



Lessons Learned

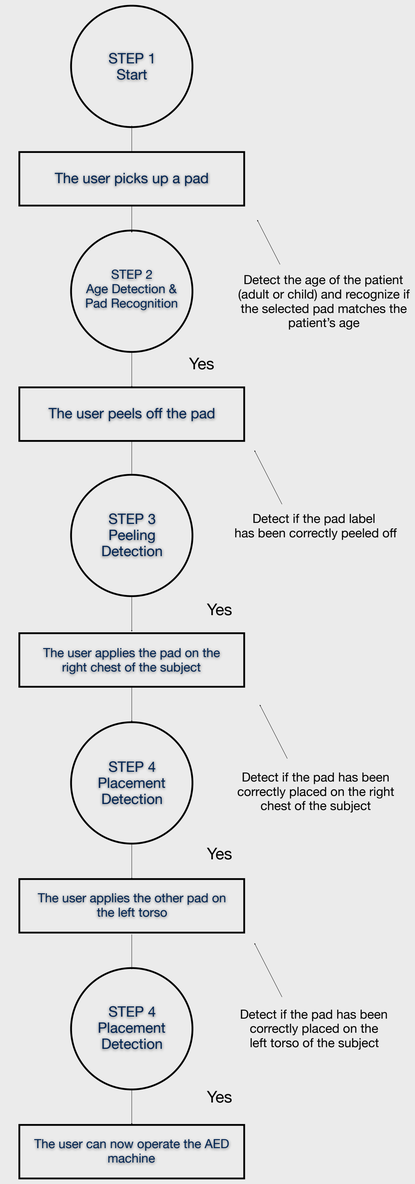
- Ensure the robustness by using the speech interface as a fallback strategy to handle lost connection and false negative issues
- State of the art deep learning techniques can give near real time output with good accuracy using a Cloudlet
- Increase the accuracy of state recognition by combining multiple computer vision techniques together (object detection, color segmentation, deep neutral network based pose detection, AR tags)

Future Work

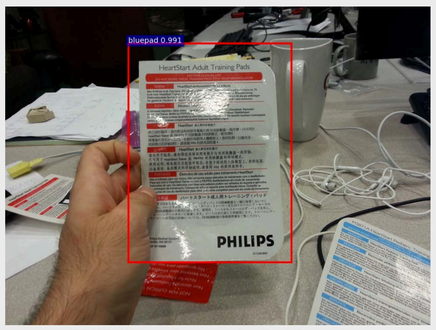
- Improve the skeleton recognition and face recognition techniques so they work from various view angles and in various lighting conditions
- Formal usability evaluation for the interface and iterative design of the workflow
- Other sensors (e.g. a depth camera) can be added to the device for better performance

Task Flow

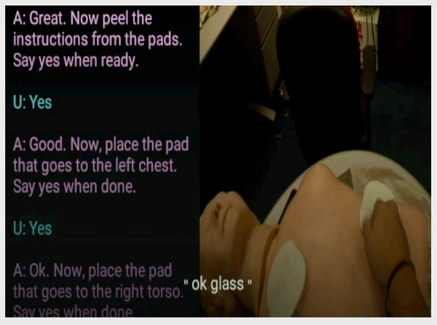
The task flow of our wearable cognitive assistant is shown as below:



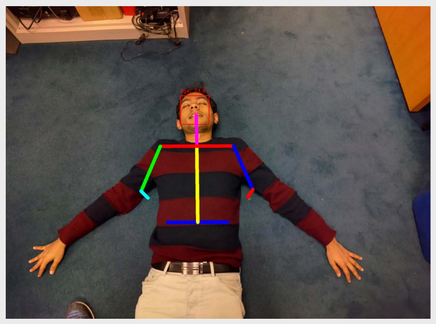
Our Solution



TPOD Object Detector for Pad Detection
using Faster R-CNN Deep Convolutional Neural Networks



Conversational Interface for Real-Time Guidance



DeepPose Human Body Skeleton Recognition with Deep Convolutional Neural Network (CNN) / Microsoft Face API for Face & Age Detection

Color Segmentation for Pad Recognition

For more information: Toby Li (tobyli@cs.cmu.edu) Jineet Doshi (jdoshi@andrew.cmu.edu)
Rui Silva (ruisilva@cmu.edu)

Scan the QR code to watch our **DEMO Video**