Finding & Locating Objects via Multi-Perspective Camera Technique

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Background

- 285 million people are visually impaired
- 90% of the Visually Impaired Persons (VIP) live in low-income settings
- 37.7% of VIP are employed
- Many times work involves multiple employees sharing same equipment so it is incredibly inconvenient for employed VIP to find and access misplaced items
- Limited ability for employed VIP to stay organized in dynamic workplace environment
- Not many affordable camera-based systems to find missing objects

Objectives

- Ability to navigate and access any item without relying on its position to stay the same.
- Give VIP the ability to be more independent.
- Allow VIP retrieve necessary objects without asking for anyone's help.

Features

- Object detection with a focus on placement and retrieval in an indoor area.
- Track object movement within a room so VIP will be able to retrieve their needed objects much quicker.
- Map room in such a way VIP will be familiar with orientation of objects via voice cues such as TalkBack on the Android.
- Allow for integration with smartphone panorama image and 360° camera to detect object location and direction.

Technologies Used

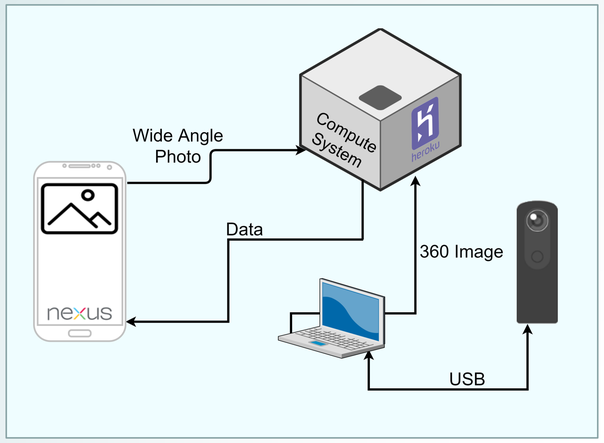
- Android smartphone for user interface and camera.
- Heroku and Amazon AWS S3 Service form the backend of the system, powered by Python and OpenCV.
- Ricoh Theta S 360 degree omnidirectional camera for motion detection in rooms.
- Google, IBM, Microsoft, and CloudSight APIs are used.

OpenCV, python, amazon web services, RICOH, Google Cloud Platform, heroku, android, CloudSight™, Microsoft Azure, IBM Bluemix™

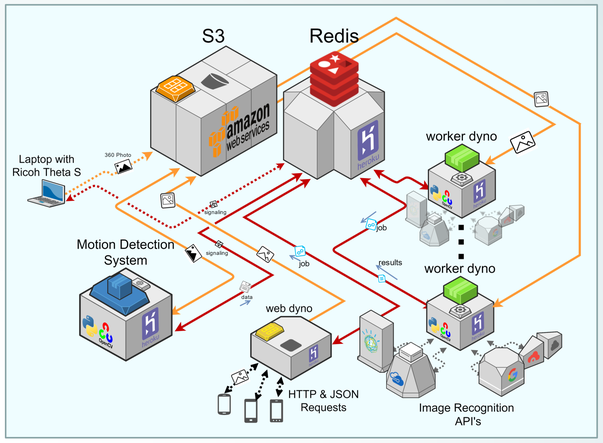
Giving the Visually Impaired the Power to become More independent, More productive, and Less stressed

Project Design

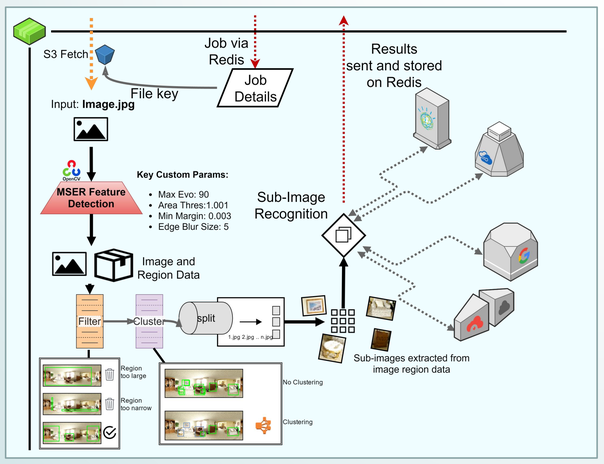
High Level Overview



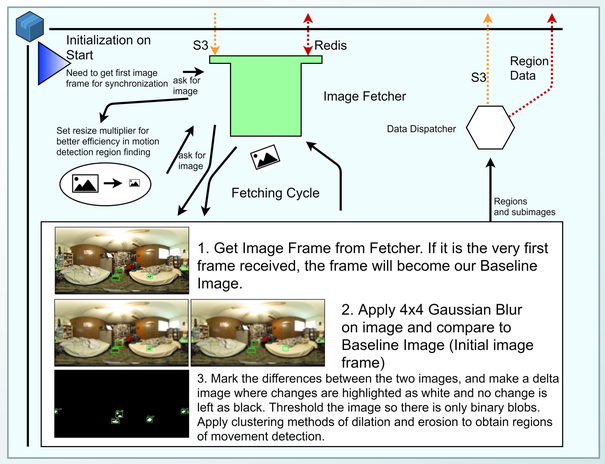
Low Level Overview



Object Detection Algorithm

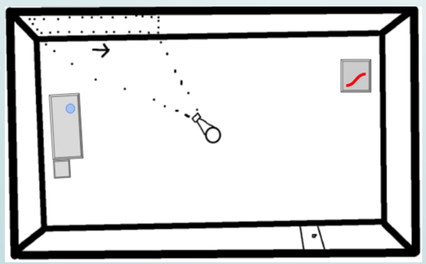


Motion Detection Algorithm

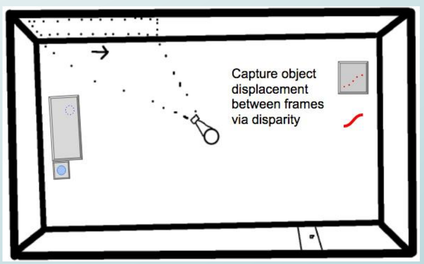


Interaction between User and System

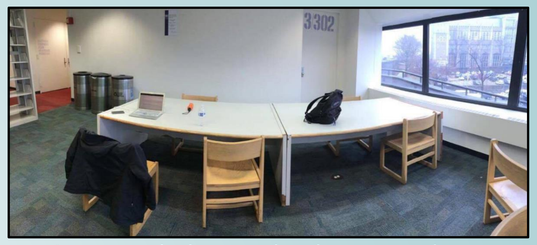
User pans across the room up to 180 degrees to get a panorama image. Image is sent to the server, and user receives locations of objects in room.



The 360 Motion Detection system detects when objects have moved in a room. This accelerates the object hunting process for the User.

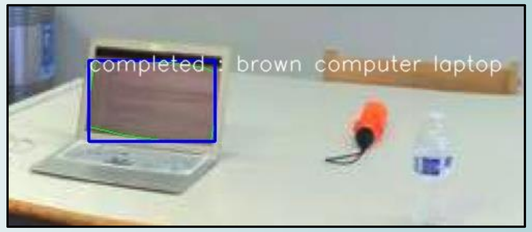


Object Detection Example



A panoramic image taken by a smartphone

Our application detecting possible objects in the panoramic image



Close up view of the identification of a laptop

Close up view of the identification of a backpack

References

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[5] Shahinur Alam, ASM Iftekhar Anam, Mohammed Yeasin. "O'Map: An Assistive Solution for Identifying and Localizing Objects in a Semi-Structured Environment ." *Journal on Technology and Persons with Disabilities* , 2015: 204-231.