Project Plan
IMAGINE: IMAGe INtake Experience
The Capstone Experience
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Functional Specifications

• Generating insurance quotes in a timely and highly accurate manner is difficult without an on-location assessment

• On-location assessments are time-consuming and costly

• By using panoramic images of locations in a virtual reality setting, adjusters can make remote assessments as if they were on site

• Object recognition can significantly reduce the time an assessment takes by automatically identifying objects of interest at a location to the adjuster
Design Specifications

• Users should be able to upload images showing an environment and have the objects within identified, located, and labeled

• Users should be able to interface with an inventory of identified objects and make edits to their information through a web portal

• An image and its inventory should be viewable and annotated in a Unity VR application

• Image environment type should be classified by the objects within the image
Screen Mockup: Web Application
Housing
List of each category

"The Smith Home" 324 Maple Street
Edit - Paragraph
Anyone Home 1
Read only - Paragraph
Anyone Home 2
Read only - Paragraph

ADD TO LIST

Sample Table

<table>
<thead>
<tr>
<th>IMAGE NUM</th>
<th>OBJECT</th>
<th>ROOM</th>
<th>CHARACTERISTICS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sink</td>
<td>Bathroom #1</td>
<td>Pedestal</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Toilet</td>
<td>Bathroom #1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Shower/Tub</td>
<td>Bathroom #2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sink</td>
<td>Bathroom #2</td>
<td>Vanity</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bed</td>
<td>Bedroom #1</td>
<td>Twin size</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Bed</td>
<td>Bedroom #2</td>
<td>Queen size</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Bed</td>
<td>Bedroom #3</td>
<td>Full size</td>
<td>Underwriting, Feb. 2018 Bedroom looks unused. May be used in a spare bedroom and not for full-time occupants. That could affect the exposure on the policy. Refer to the agency to confirm.</td>
</tr>
<tr>
<td>6</td>
<td>Table</td>
<td></td>
<td></td>
<td>Underwriting, Feb. 2018 looks like the dining room table</td>
</tr>
<tr>
<td>7</td>
<td>Couch</td>
<td>Living Room #1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ADD TO LIST
Screen Mockup: Web Application
Screen Mockup: VR Menu

Auto-Owners Insurance

- Housing
- Office
- Restaurant
- Others
Screen Mockup: VR User Interface
Technical Specifications

• Panoramic photos are processed by the object recognition system (OpenCV/TensorFlow) to identify objects of interest and store their locations and information in a database (MariaDB)
• A VR Headset (Oculus Rift) can be used to view panoramic photos and annotated versions of the objects in them in an immersive manner
• The web application (PHP) can be used to see a manifest of the objects found in a photo, information about that photo’s environment, as well as to edit the information of those objects and information about the photo’s environment
System Architecture

Server-Side Applications

- Object Recognition System
  - Submits Environment Images for Object Identification
  - Creates Object Listings in Object Database

- User System
  - Manages User Data, Updates Data, Retrieves Data, Creates Data
  - Database MariaDB

Client-Side Applications

- VR Application
  - Provides object data and image environments
  - Displays panoramic view of uploaded environment and object info

- Web Application
  - Creates environments, allows user to create and edit object and environment data
  - User uploads omnidirectional images to web portal

External Hardware

- Oculus Rift Headset
- Oculus Rift Controllers
- Omnidirectional Camera

Team Auto-Owners Project Plan Presentation
System Components

- **Hardware Platforms**
  - Oculus Rift VR Headset
  - Oculus Rift Touch Controllers
  - Dell PowerEdge Server
  - CUDA Graphics Processing Unit

- **Software Platforms / Technologies**
  - Unity Game Development Studio
  - OpenCV
  - TensorFlow
  - GitLab
  - PHP
  - MariaDB
  - Ubuntu Server
Risks

• Inability to classify an environment
  ▪ Environments should be classified based on types of objects found (i.e. bedroom, office, etc.)
  ▪ Train negative classifiers to drop incompatible environments

• Multiple concurrent users
  ▪ Multiple separate workflows will need to be able to be accessed by all users
  ▪ Manage interactions with a user system using transactions to enforce ACID

• Object recognition in spherical images
  ▪ 3D images have distorted pixel densities and will make classifying difficult
  ▪ Normalize 3D images to 2D or include warped images when training our classifier

• Server Access Limited by MSU Firewall
  ▪ MSU has firewall rules that prevent some external communications
  ▪ Pipeline traffic through channels that are not restricted
Questions?