Dwight Look College of
ENGINEERING
TEXAS A&M UNIVERSITY

Team 5: 3D Occluded Object Detection System

Bi-Weekly Update 4

Team members:
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Hannah Hillhouse
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Sponsor:
Kevin Nowka

Project Summary

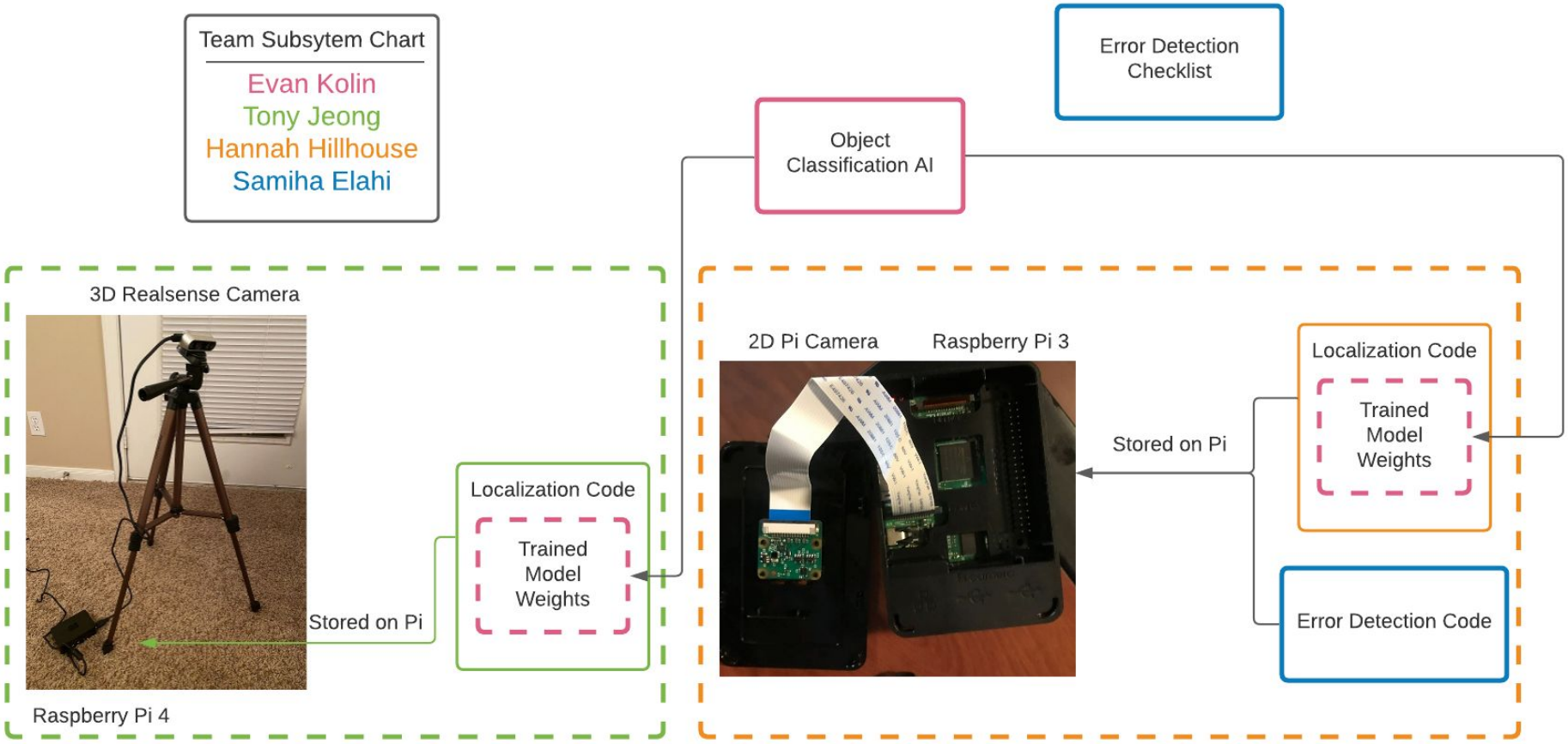
Problem:

Manufacturers are using people to pick and place parts into bins for further use. This is not only costly to the company but also not time efficient and results in a very cluttered workspace.

Solution:

We will create an object detection system in which will localize and classify objects within the parts bins and pick and place them into their corresponding bins for further use. We have two cameras, one to look into the bin with all the parts, and one to look at the bin with already picked parts. Both cameras are attached to a raspberry pi that holds the object classification model and the object localization code.

Project/Subsystem Overview



Project Timeline

New parts ordered or received (completed Sept 22)	New dataset finished (completed Sept 22)	Error Detection/2D Camera Integration (to complete by Oct 18)	AI/2D Camera Integration (to complete by Oct 25)	AI/3D Camera Integration (to complete by Nov 5)	Total Project Integration (to complete by Nov 10)

2D Camera Subsystem

Hannah Hillhouse

Accomplished since last update 20+ hrs	Ongoing progress/problems
- labeled new dataset - trained new dataset on yoloV5	- debugging yoloV5 trained dataset since somewhere it is still training on pre-trained dataset - finish integration with error detection and start validation since AI is not working

2D Camera Subsystem

Hannah Hillhouse

- Currently training is still using the pretrained dataset even though our new dataset has been imported. I need to find exactly where it is pulling the pre trained dataset during training in the code.
- I can validate with the error detection once issue is solved, but as we can see on the picture on the right the “I” shape pvc is labeled as a cup and should be labeled as an “I” shape pvc.


```
image 315/367 C:\Users\hanna\yolov5\data\images\IMG_3021.jpeg: 640x480 1 laptop, Done. (0.274s)
```

3D Camera Subsystem

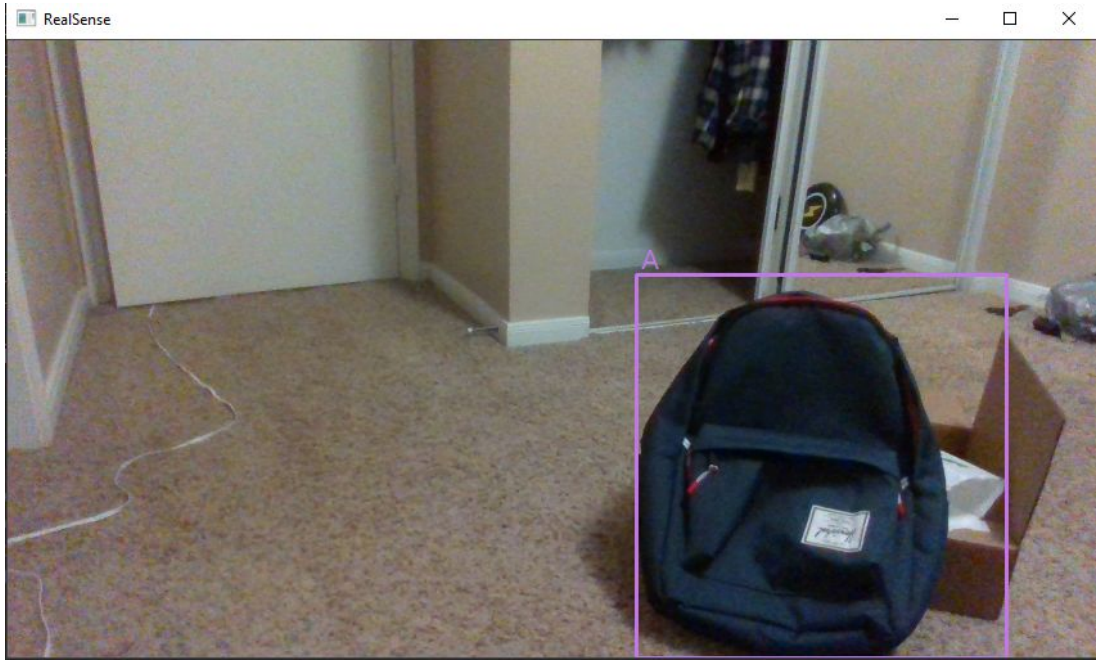
Tony Jeong

Accomplished since last update 8 hrs	Ongoing progress/problems
-Updated my code to label each object on the screen. -Finished hardware integration.	-Working with trained model.

3D Camera Subsystem

Tony Jeong

Once Evan's trained model does localization, my part could be said done with integration and needs only validations.



Object Classification Subsystem

Evan Kolin

Accomplished since last update 20+ hrs	Ongoing progress/problems
• Redesigned Tensorflow Model to do not only classification but also localization • Validated model classification	• Create csv file from multiple text files containing localization training data • Validate model localization • New model will complete integration with both 3D and 2D subsystem, resulting in 100% integration

Object Classification Subsystem

van Kolin

- Previously the plan was for my subsystem to supply classification and the camera subsystems would do localization, but as of last lab I'm also doing localization. Spent the past weekend completely remaking my model to handle two types of input/output: image and localization data.
- Currently localization should work but can't be validated due to csv error. Will complete by end of week.
- Once localization is complete will have 100% system integration.

```
def txt_to_csv(path, skipNegatives):
    print("start")
    txt_list = []
    for txt_file in glob.glob(path + '/*.txt'):
        tree = ET.parse(txt_file)
        root = tree.getroot()
        if root.find('object'):
            for member in root.findall('object'):
                bbx = member.find('bndbox')
                xmin = round(float(bbx.find('xmin').text))
                ymin = round(float(bbx.find('ymin').text))
                xmax = round(float(bbx.find('xmax').text))
                ymax = round(float(bbx.find('ymax').text))
                label = member.find('name').text
                value = (root.find('filename').text,
                         int(root.find('size')[0].text),
                         int(root.find('size')[1].text),
                         label,
                         xmin,
                         ymin,
                         xmax,
                         ymax
                         )
                print(value)
                txt_list.append(value)
        elif not skipNegatives:
            value = (root.find('filename').text,
                         int(root.find('size')[0].text),
                         int(root.find('size')[1].text),
                         NEGATIVE_CLASS,
                         0,
                         0,
                         0,
                         0
                         )
            print(value)
            txt_list.append(value)

    column_name = ['filename', 'width', 'height',
                   'class', 'xmin', 'ymin', 'xmax', 'ymax']
    txt_df = pd.DataFrame(txt_list, columns=column_name)
    return txt_df
```

Error Detection & Handling Subsystem

Samiha Elahi

Accomplished since last update - 7 hrs	Ongoing progress/problems
- Finished bug fixing with Hannah's training since AI is not working yet	- Help Hannah figure out why her model is still being trained using the pre trained dataset even after the new dataset has been imported

Error Detection & Handling Subsystem

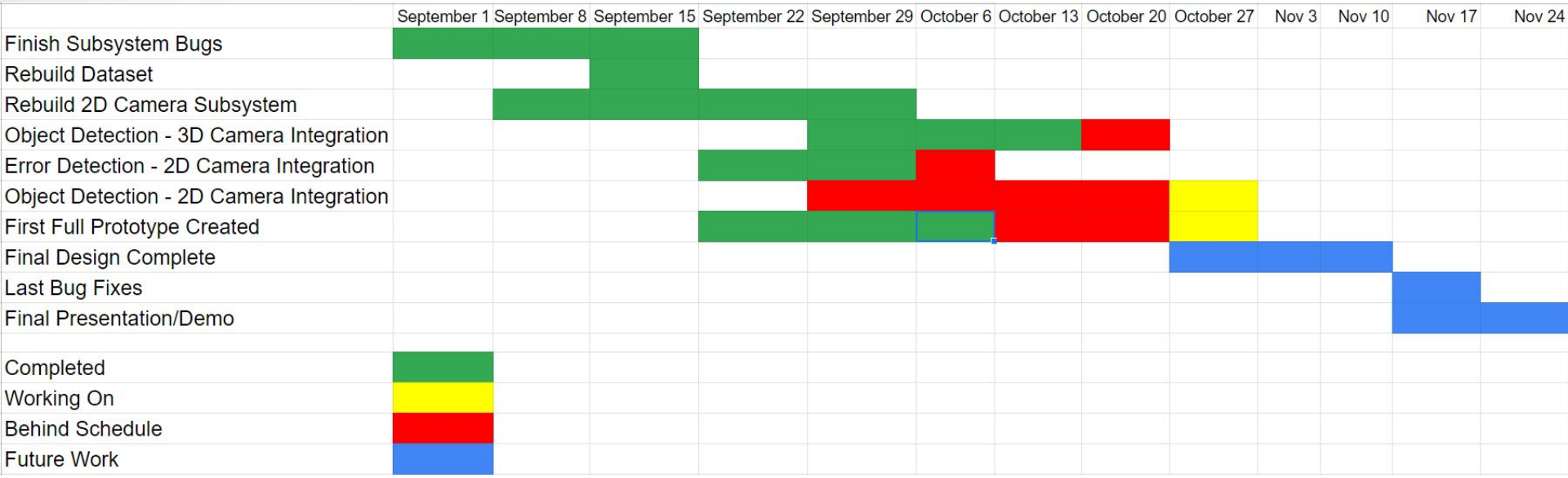
Samiha Elahi

- Get the python code of the 2D subsystem working with Hannah and start integrating it with the Error Detection subsystem asap

- I have created a checklist of errors that can go wrong after integration and during validation I will check if those errors can easily fixed

Problems	Solution
Object outside camera frame	Change the camera angle
AI thinks T shaped is an I shaped pvc	Rearrange the parts
Object occluded/hidden	Shake the bin
AI not detecting a part at all	Rearrange the parts
AI detecting the wrong object	Move the position of the objects

Execution Plan



Thank You

Questions?