



**ROBO IN  
MANHATTAN**

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15-494**

# THE PROBLEM.

Since VEX is an infamously shy robot and only looks down...

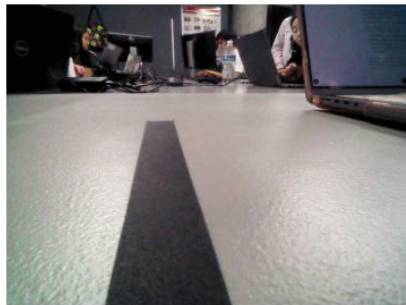
**Can the robot travel along a tape, wherever the tape extends?**



# WE TRIED

## Steering

Original Image



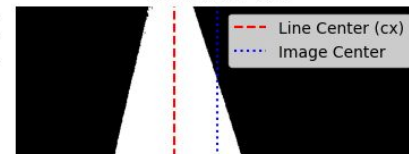
Grayscale Image



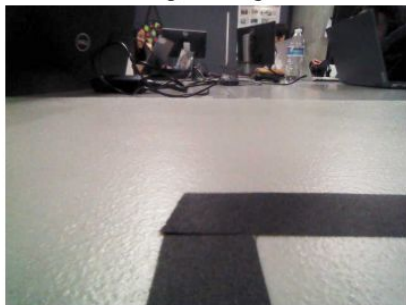
Binary Image (Thresholded)



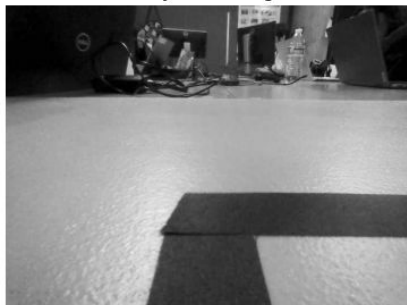
ROI (Error: -68)



Original Image



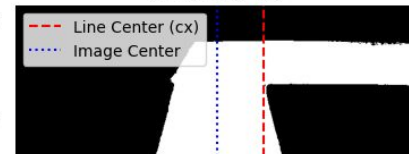
Grayscale Image



Binary Image (Thresholded)

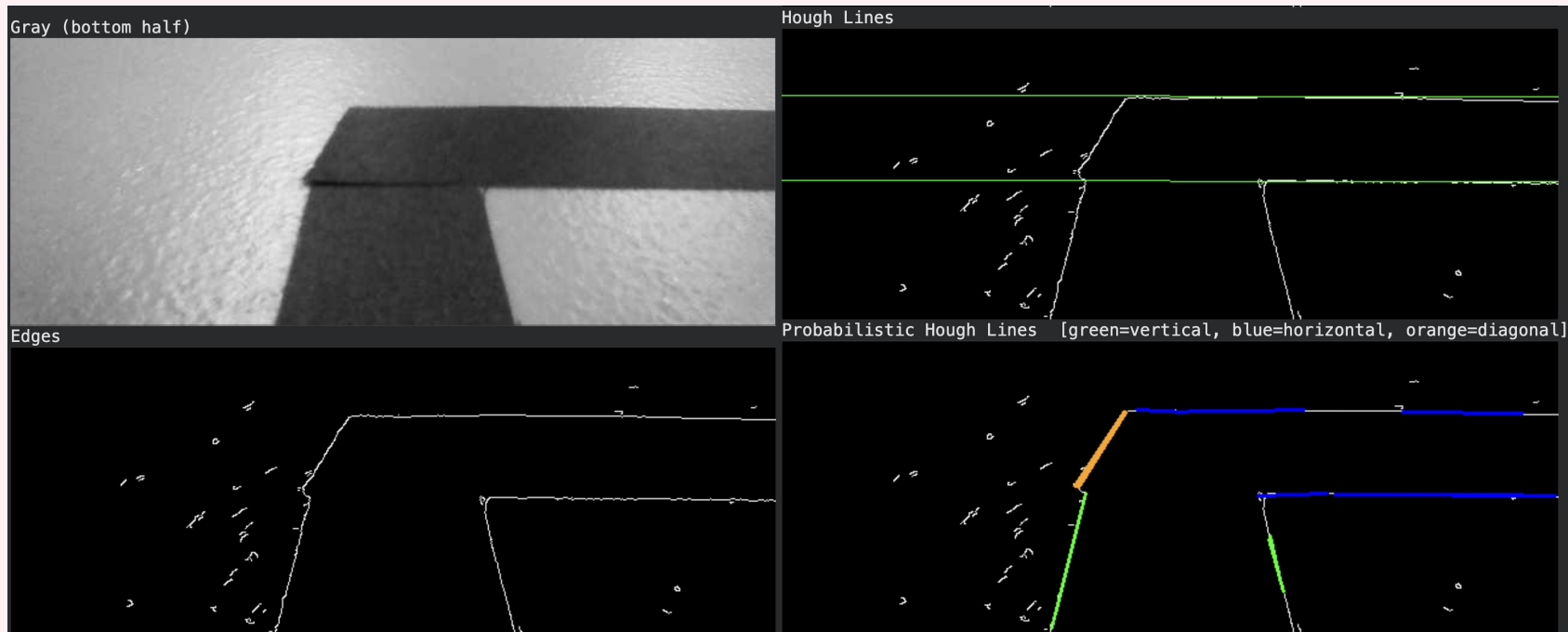


ROI (Error: 73)



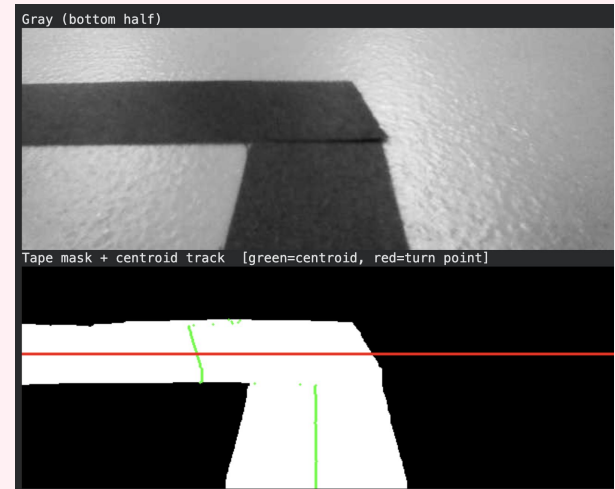
# WE TRIED

## Hough transform



# FINAL APPROACH

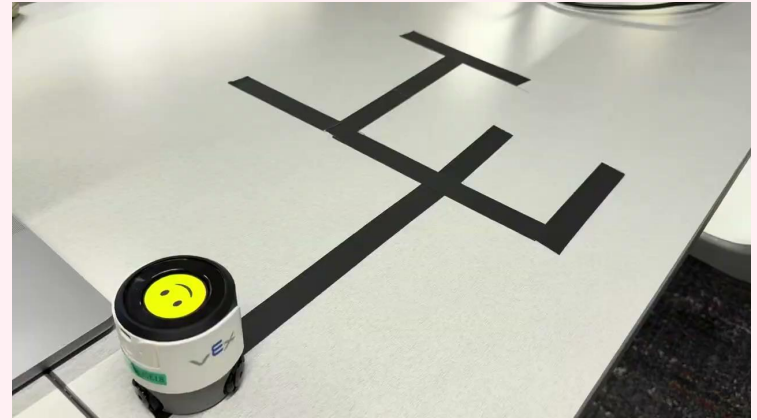
- Color segmentation
- Centroid + Tape width tracking
- Iterative hand-off between evaluation and motion
- Anticipate turns, junctions and terminations



# IN-CLASS DEMO

The robot:

- Identifies and handles turns, T-junctions, side junctions, cross junctions
  - Asks user for directions at junction
- Goes forward if tape is detected but no turns/junctions is detected
- Stops if no tape is detected



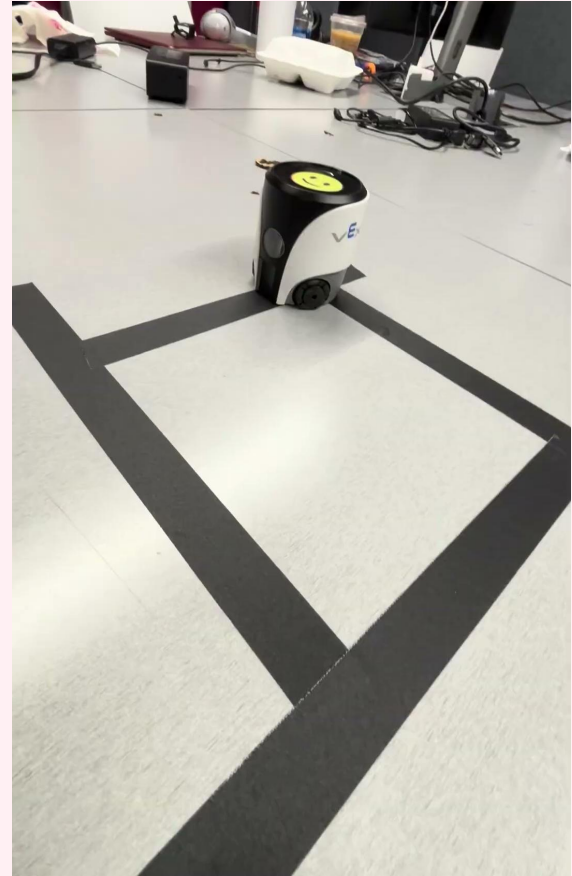
<https://drive.google.com/file/d/1ZrTm4W8-WrlmJMrztIA-CNTBOKrimPbD8/view?usp=sharing>



Image source: Packt

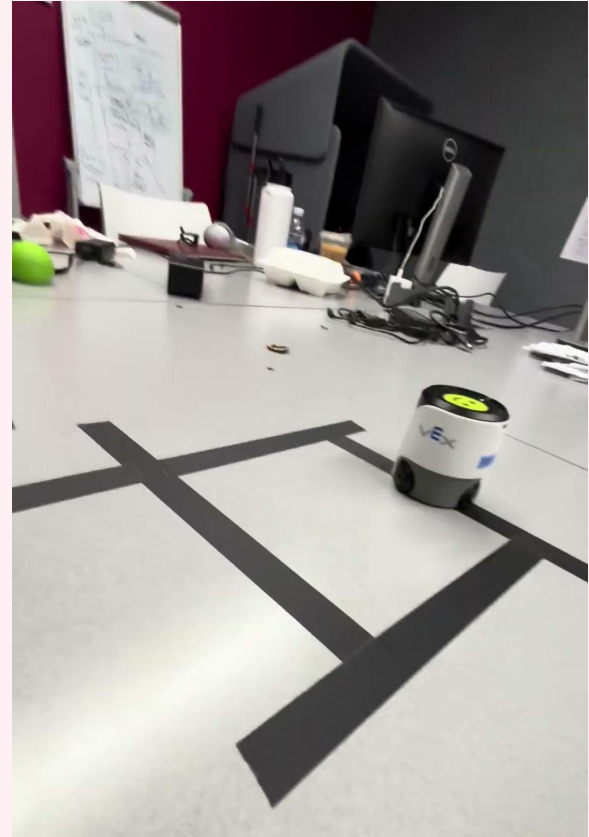
# EXTENSIONS DEMO

- **Following natural language instructions for junction decisions**
- **Integration of ChatGPT**
- **For example**
  - **Always turn left**
  - **Go in a clockwise direction**
  - **Able to repeat instructions indefinitely**



# EXTENSIONS DEMO

- For example
  - Finite list of instructions
  - Defaults to asking for user for directions at junction through tm when it runs out of decisions





# NEXT STEPS

- Mitigating false positives in tape detection
- Occasional steering correction would be helpful
- More robust natural language instructions to navigate a more complex map
- Enable turns of all angles (get out of upper manhattan)
- Debug why the robot sometimes makes a turn before terminating on tape end

# THANK YOU FOR A GREAT SEMESTER!

Link to all video demos:

<https://drive.google.com/drive/u/0/folders/17O5AIEYLxU2cxrhkBSucfvuBYczvuwS1>

Link to GitHub Repo:

<https://github.com/CarmellaLi/15-494-final-project>