UCLA Samueli School of Engineering

LEMUR

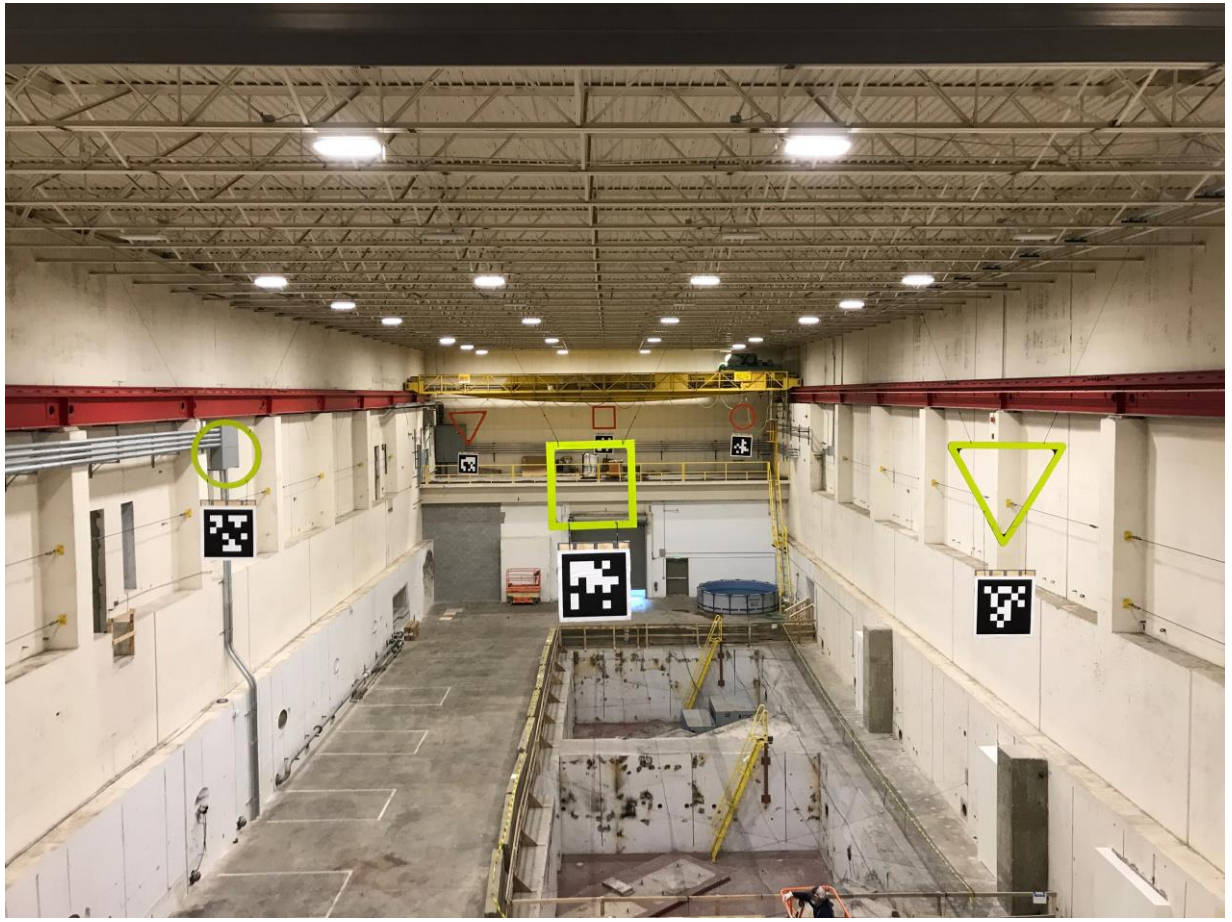
FORAY project: Autonomous blimps playing air soccer games

Project lead: Zhaoliang

Team members: Aaron, Justin, Kamil, Zhiying

11/8/2021

Background introduction: Defend the public



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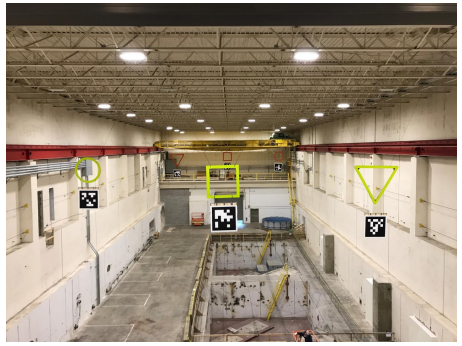
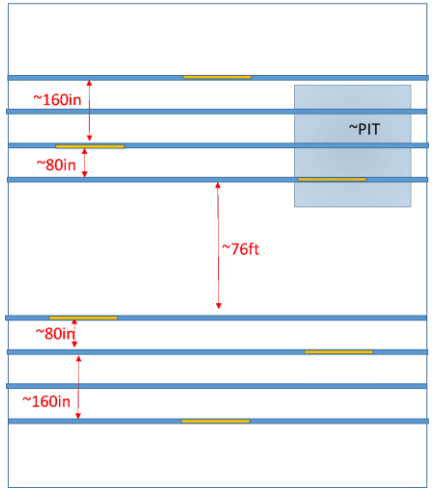
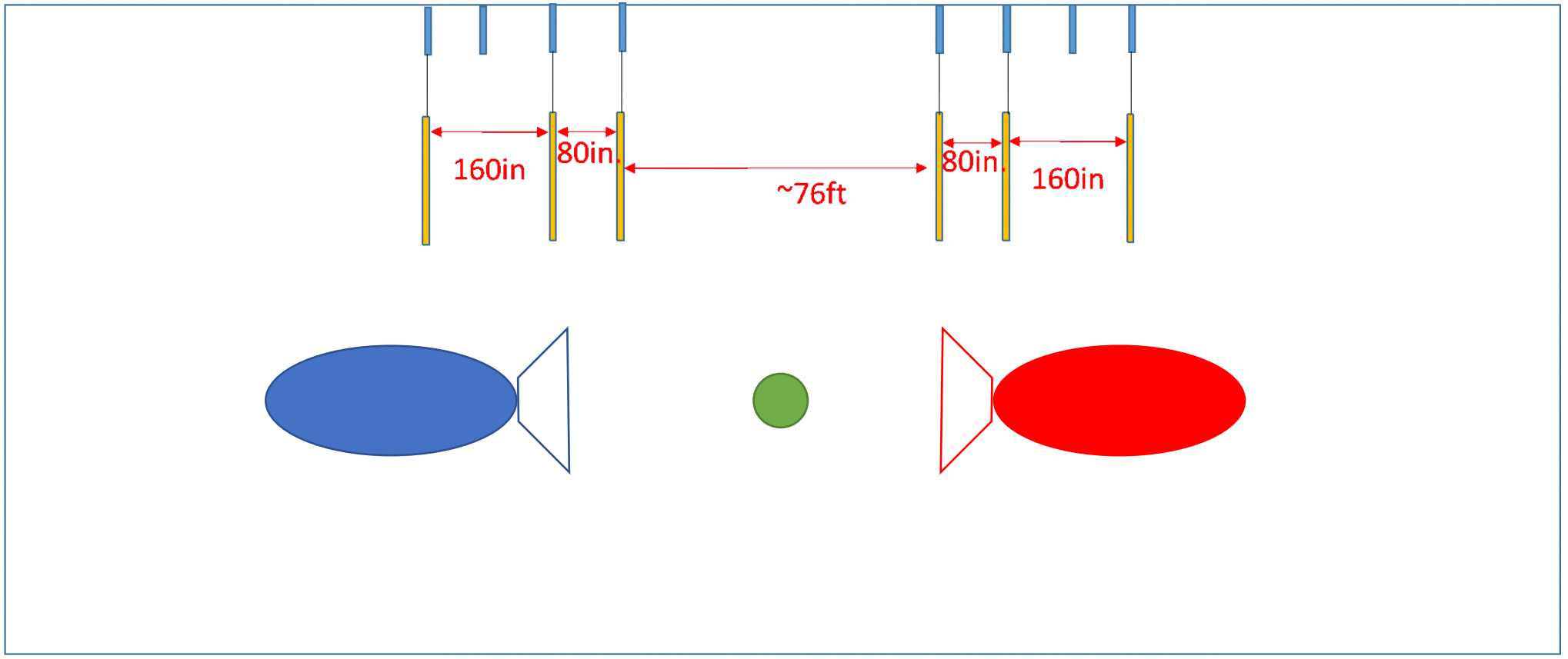
Background introduction







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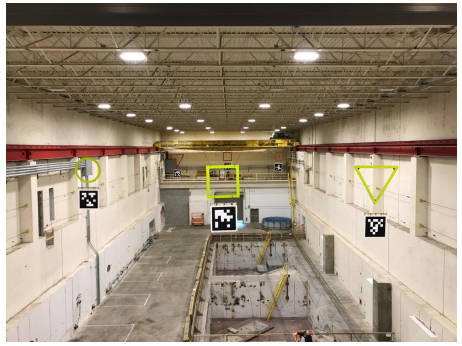

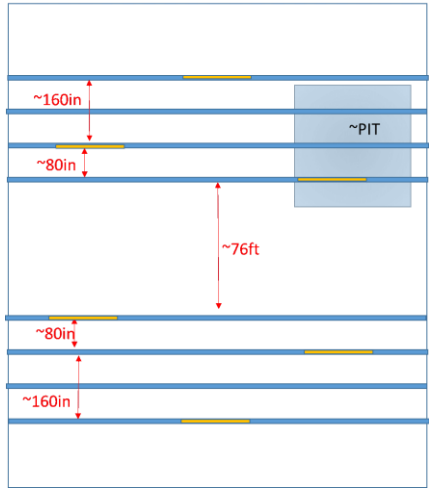

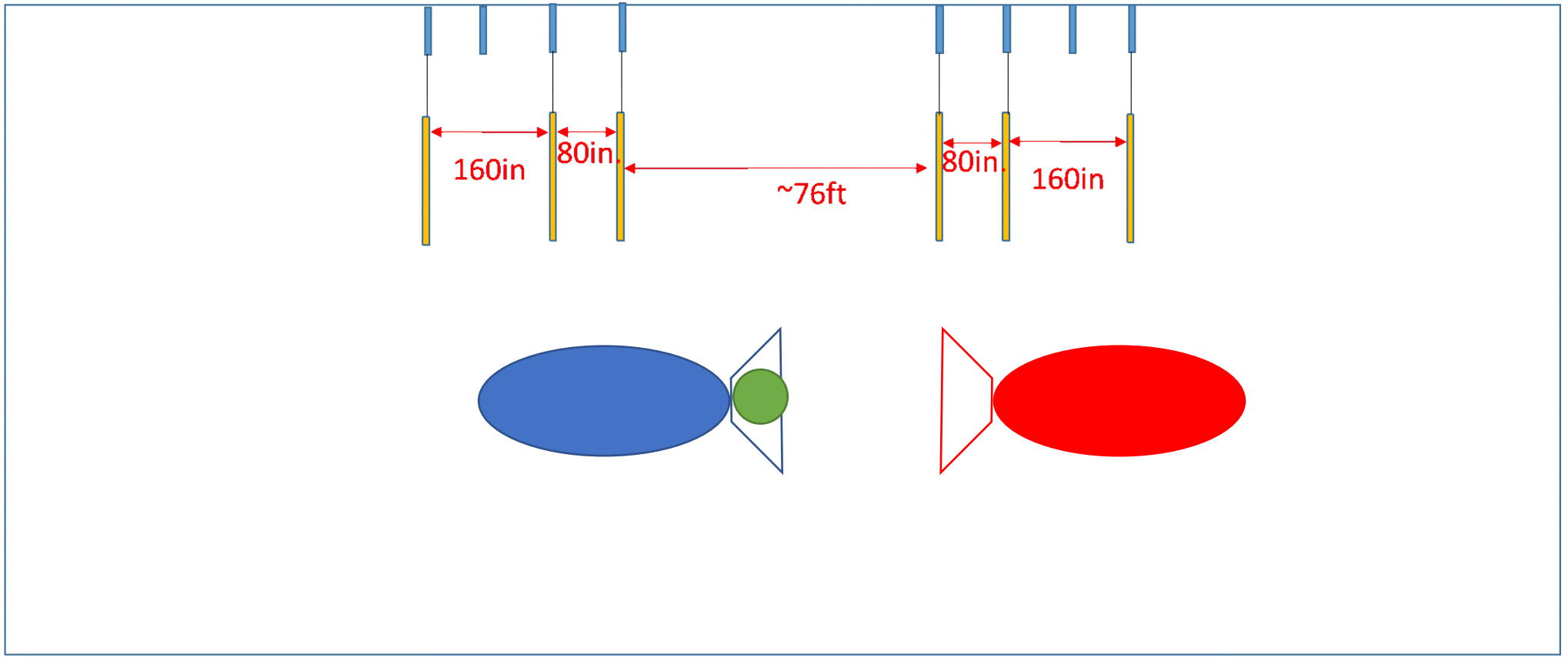

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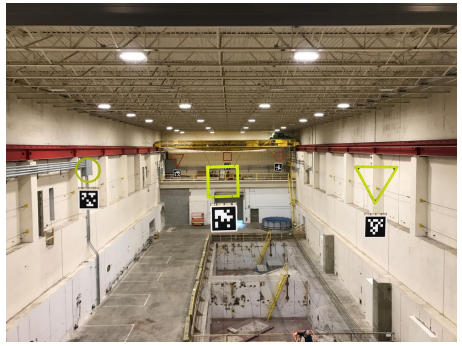
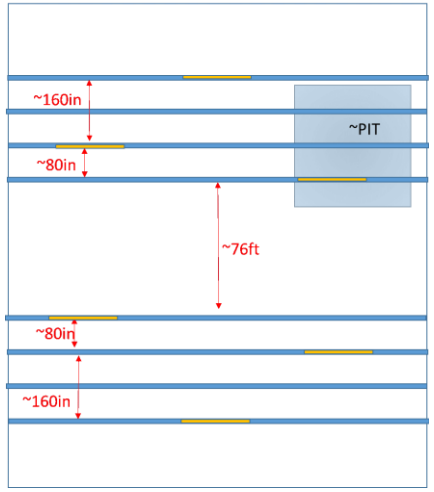
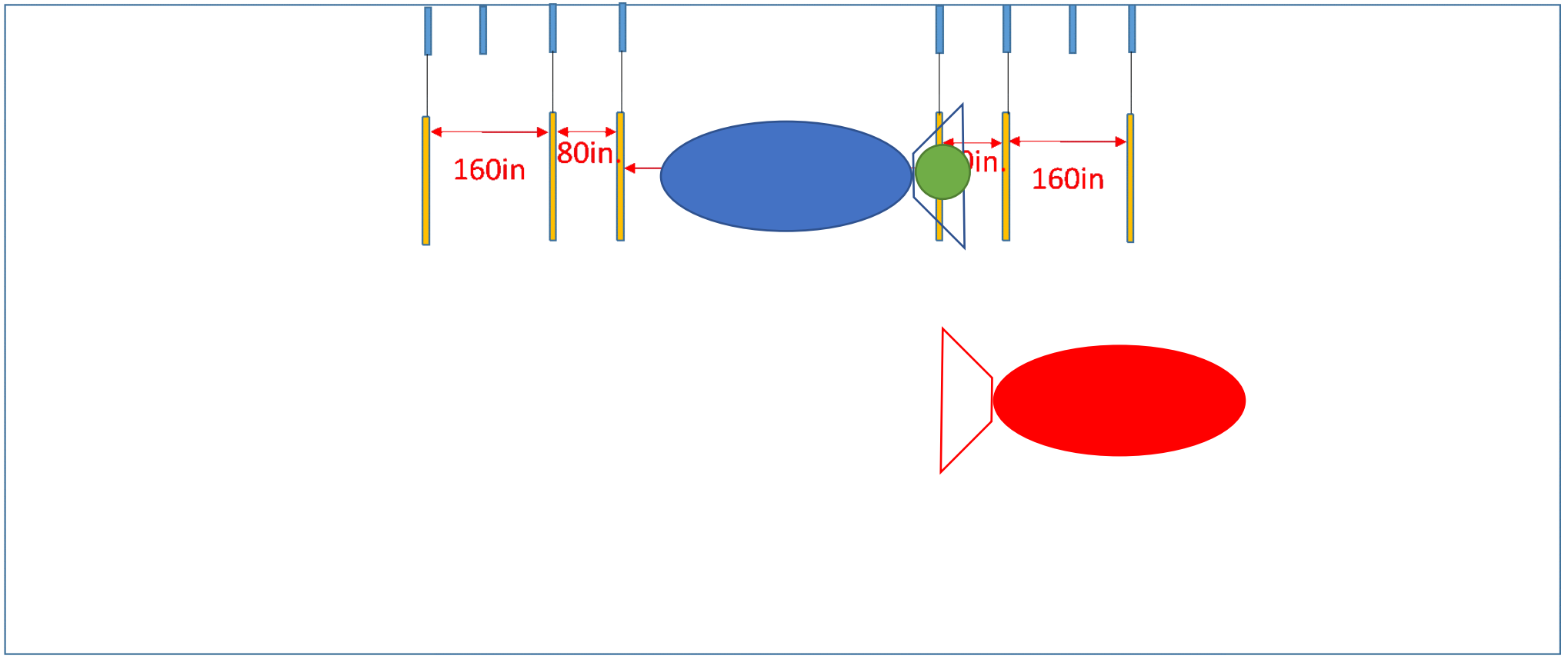
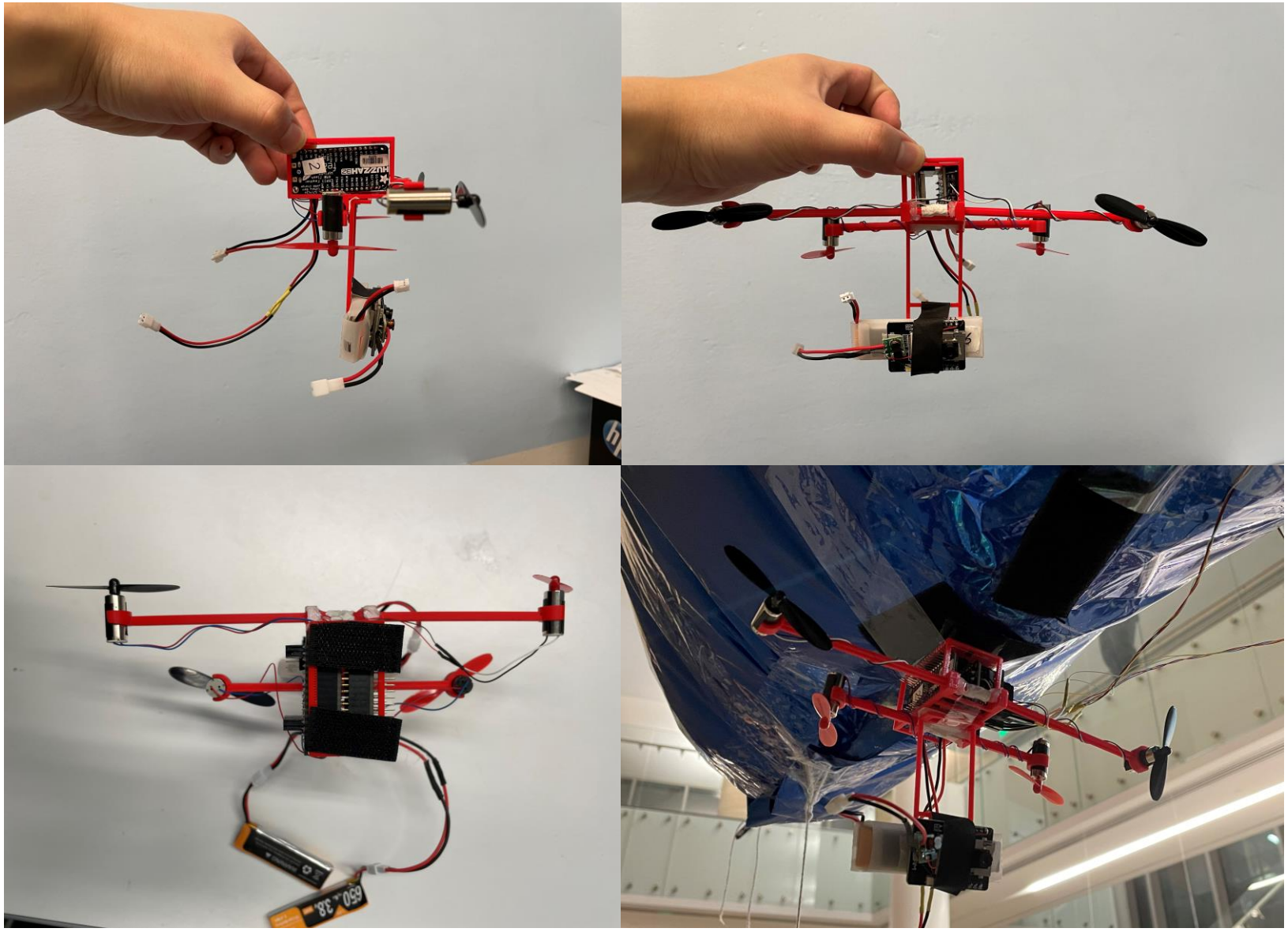


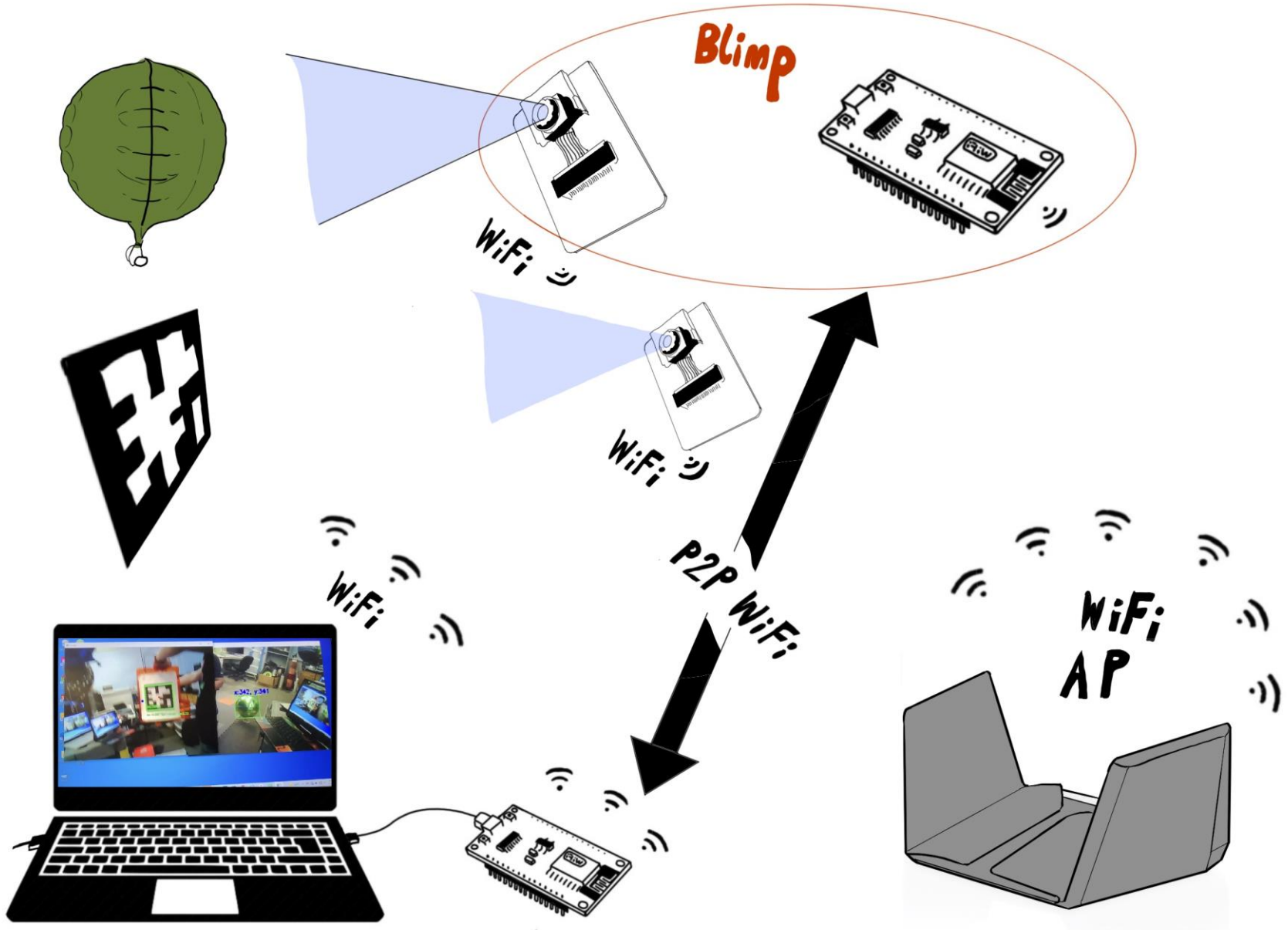




Hardware connection- propulsion system



Hardware connection- Network communication



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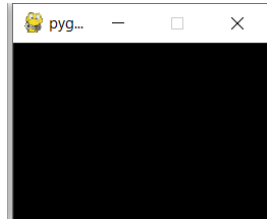
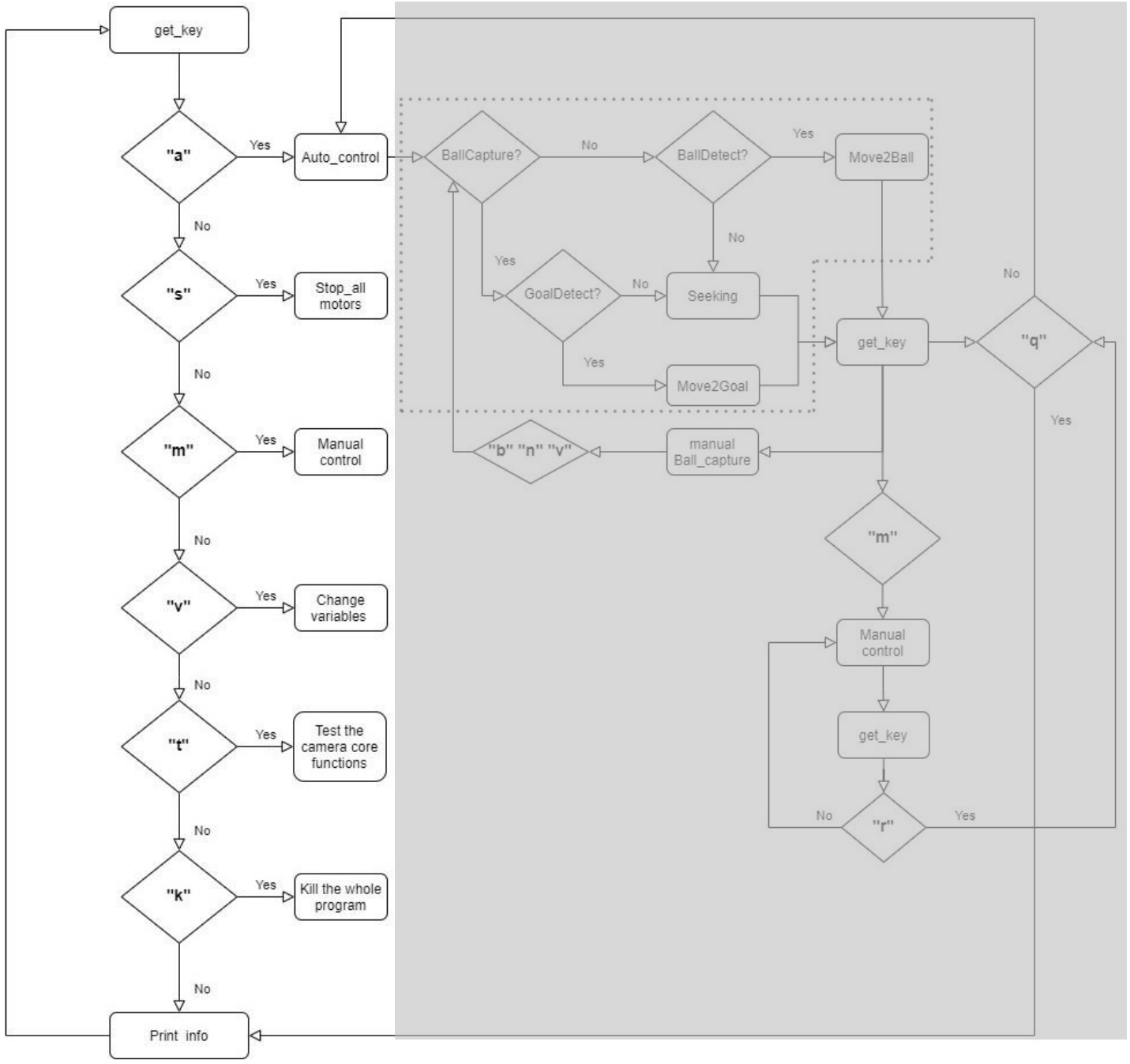
High-level logic





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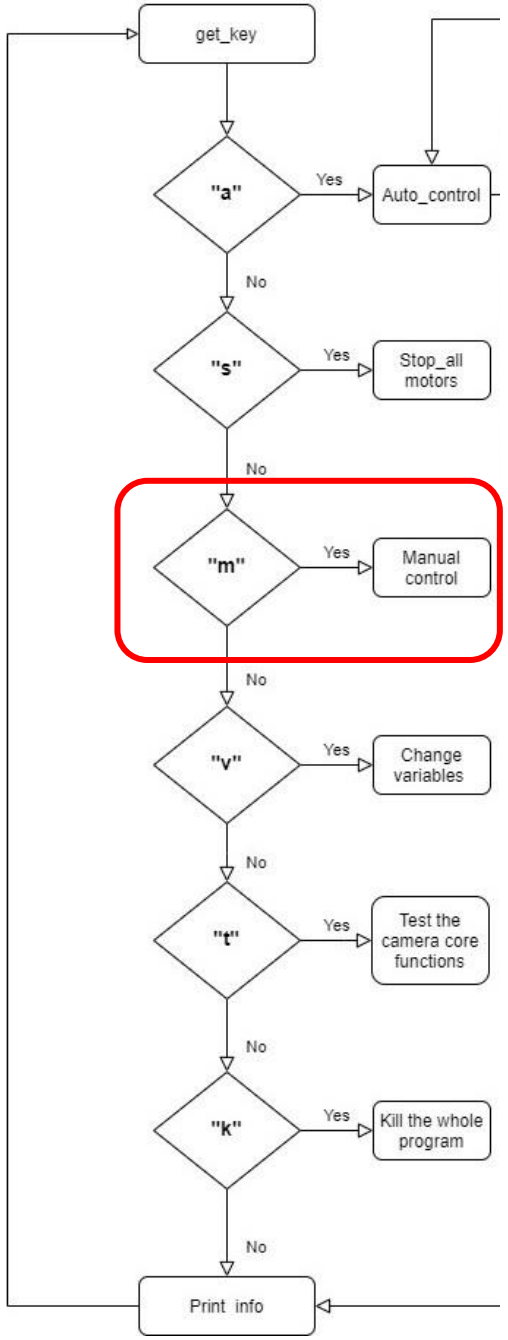
High-level logic (1)

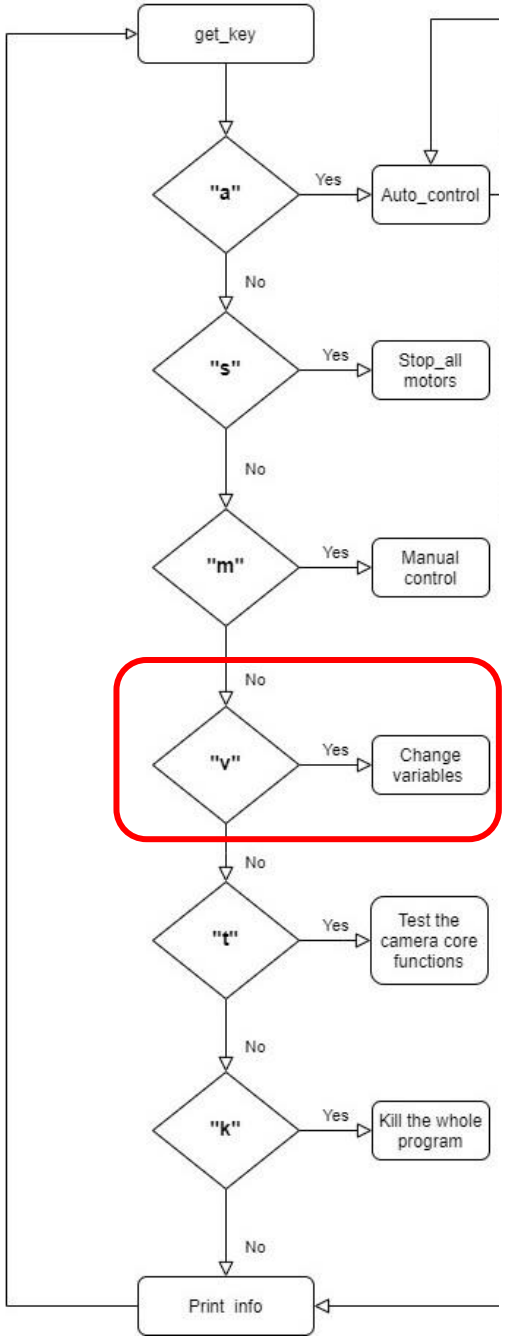


What to test?

- Check if the p2p connection is established
- Check if all motors are responding
- Check if the mapping between commands and motor+propellers is correct (you should feel the right wind flow by your hand)

High-level logic (2)

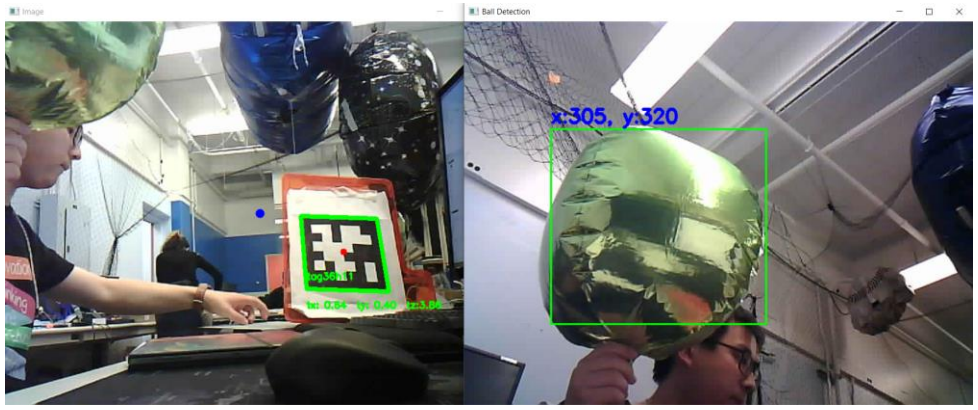
```
C:\Windows\System32\cmd.exe - python  main_keyboard.py
(foray3) C:\FORAY\november-2021-blimp-competition\Code\Control\Laptop_Code>python main_keyboard.py
pygame 2.1.0 (SDL 2.0.16, Python 3.7.0)
Hello from the pygame community. https://www.pygame.org/contribute.html
Enter your variable: stsp
Enter your value: 150
start_speed:150
No subsystem is running
```

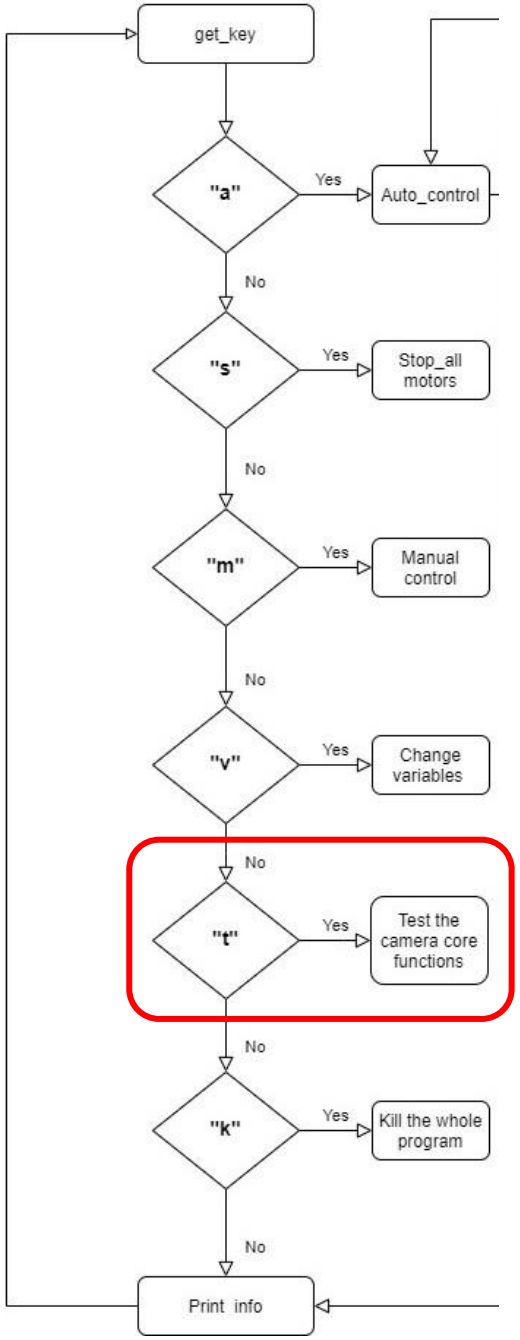


What to test and check?

- Check if the variable value can be changed by inputting the variables name and value.
- The default start_speed (pwm) for all motors are 70, which is very small. We could change it to make it bigger and this value should be less than 255 (ex: 200).

High-level logic (3)





What to test and check?

- Check if the camera address is correct
- Check if the ML model is running correctly
- Check if the April tag detection is correct
- Check the image delay, a little bit of delay is ok but huge delay is not ok and in that case, we need to change a new ESP-cam.

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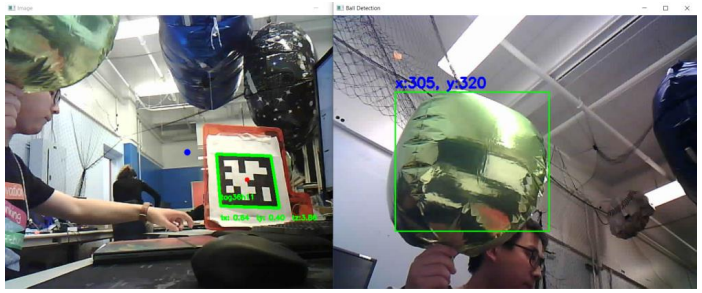
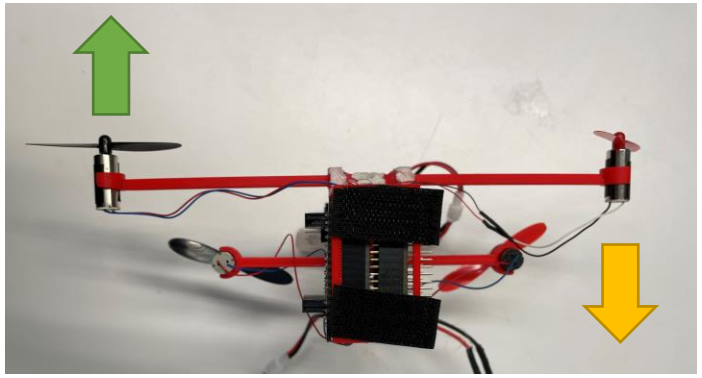
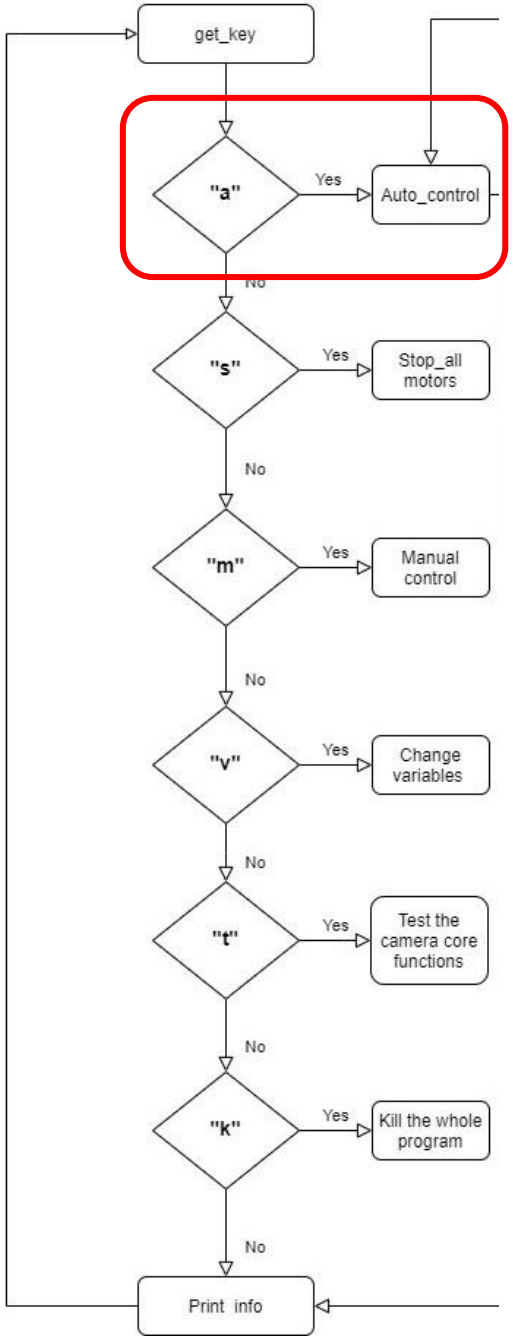
High-level logic (4)







What to test and check?

- Check if the two ESP-cams are working fine with auto control
- Check if the motor will response to the green ball and April tags

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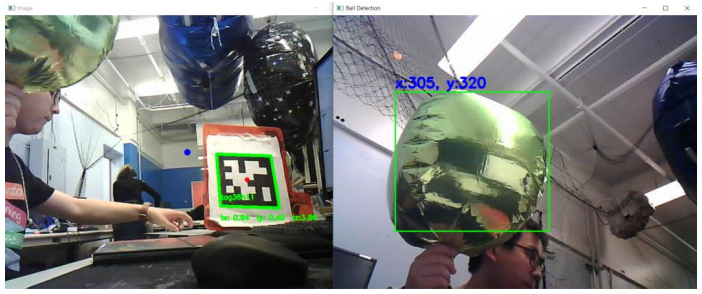
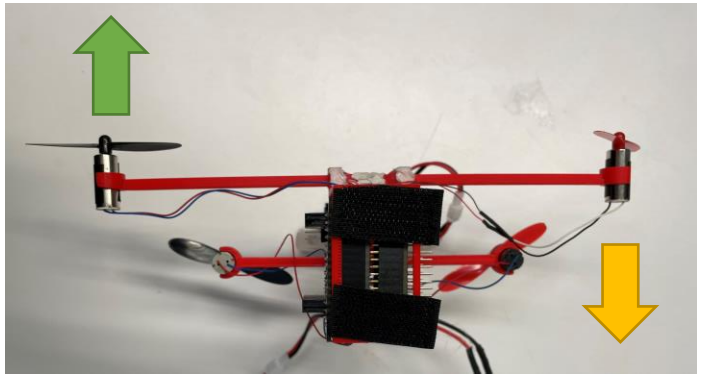
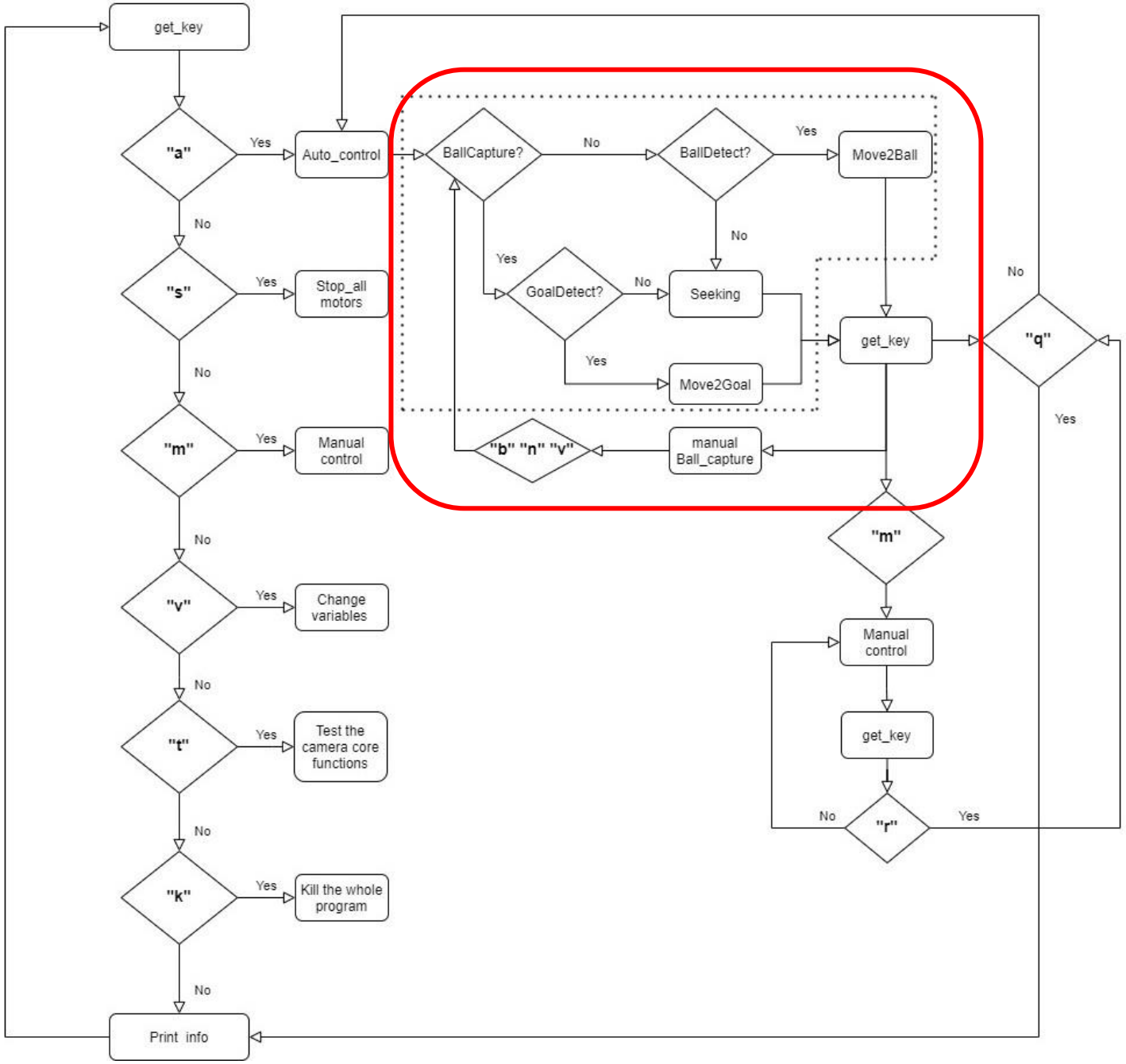
High-level logic (4)







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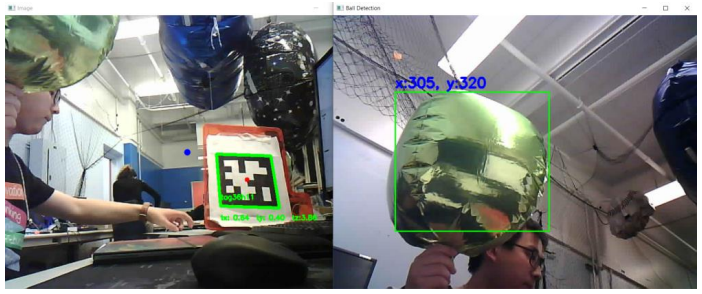
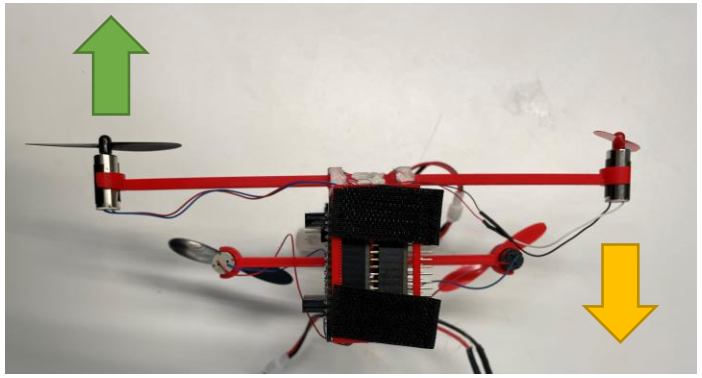
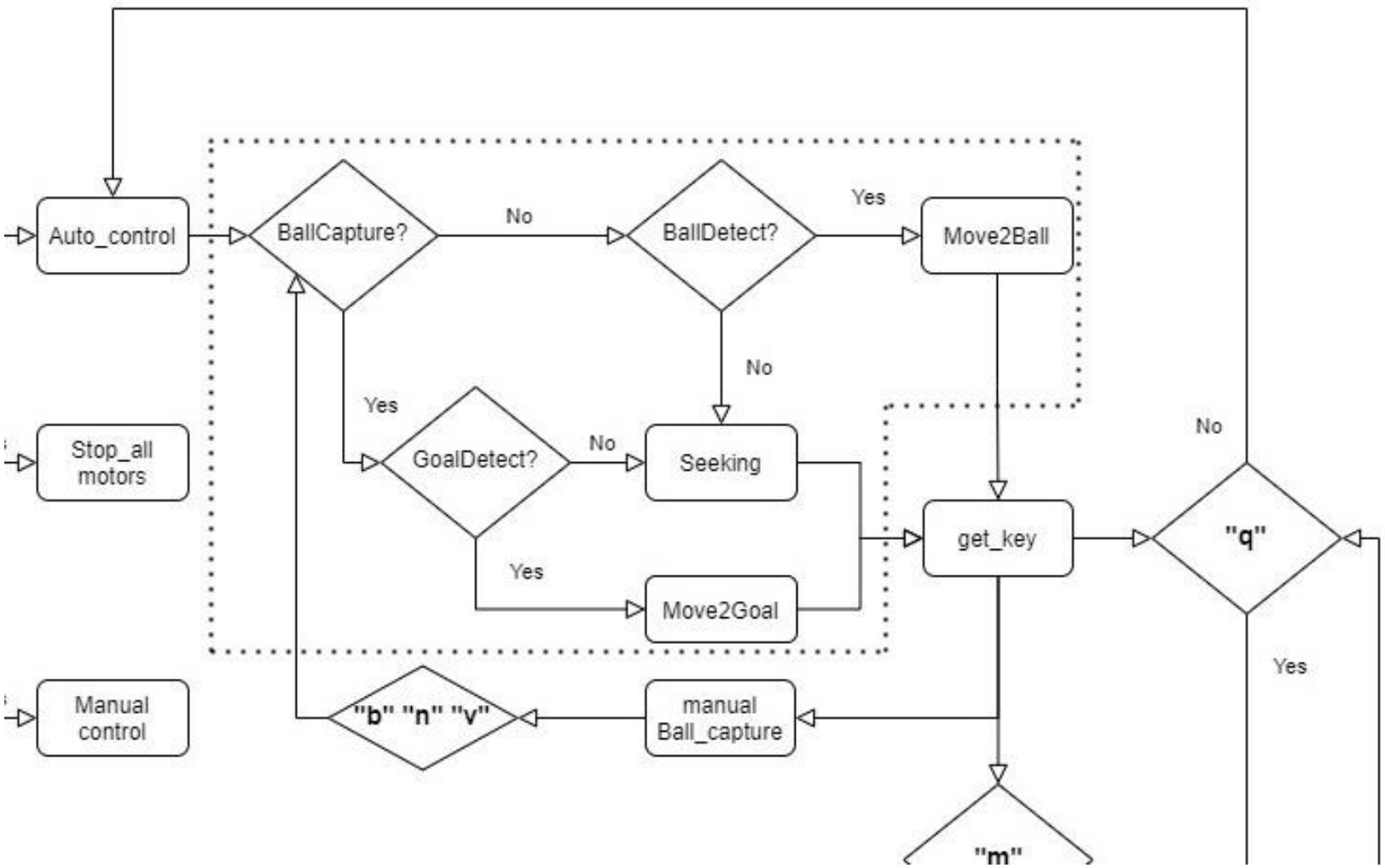
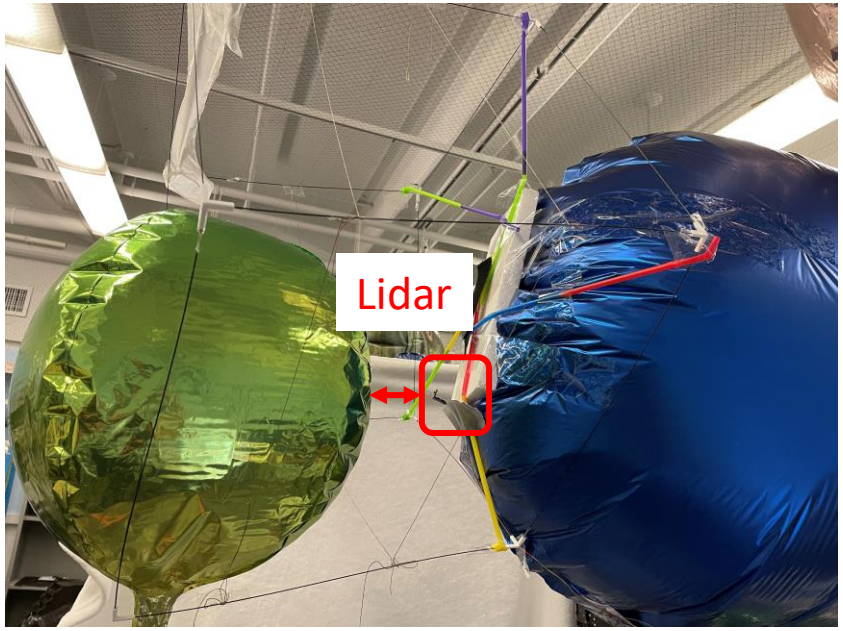
High-level logic (4)

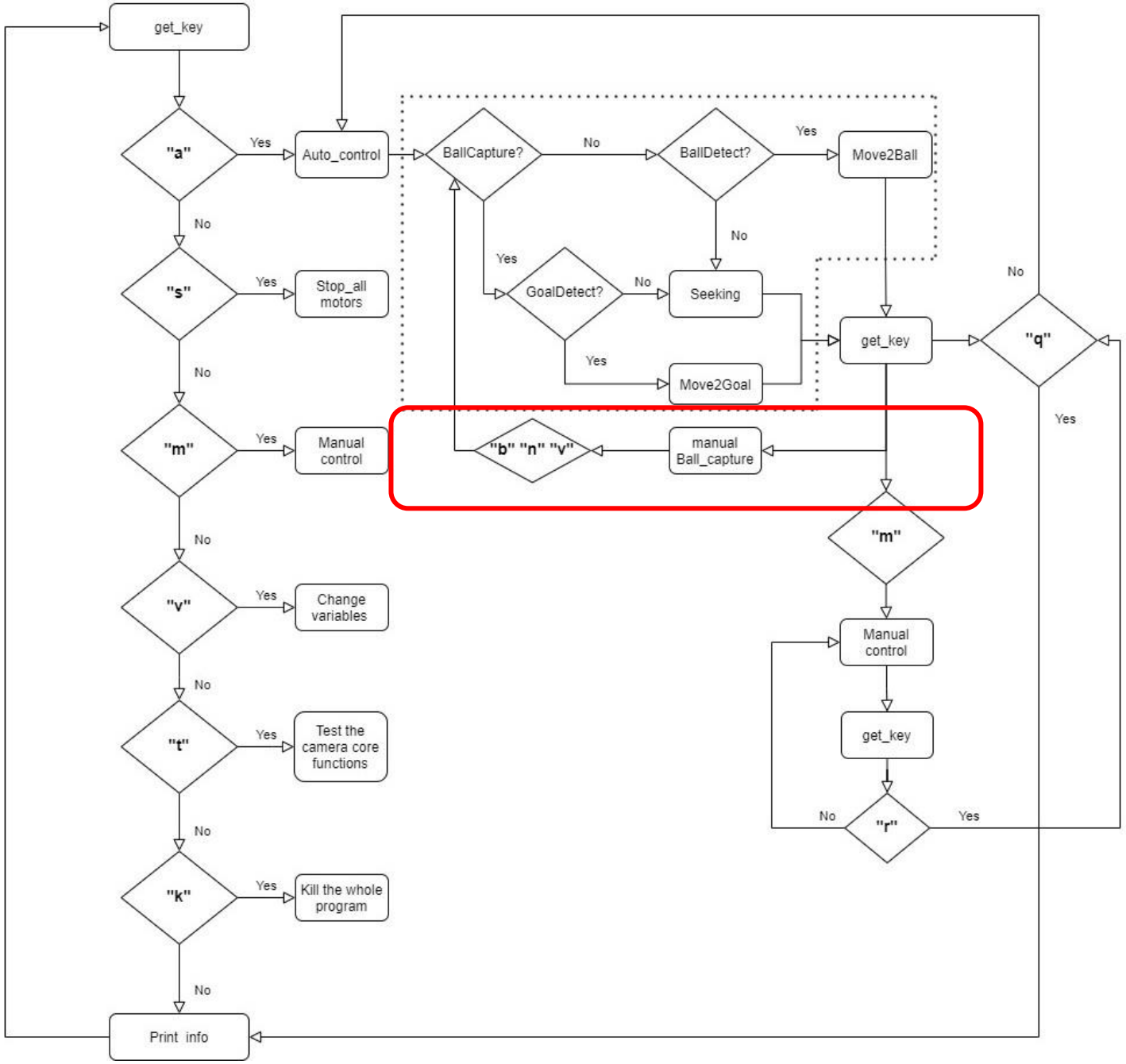






High-level logic (4)





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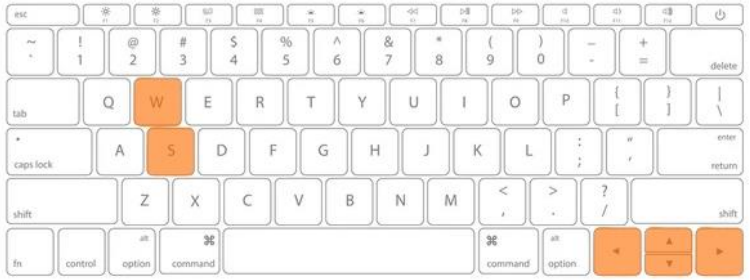
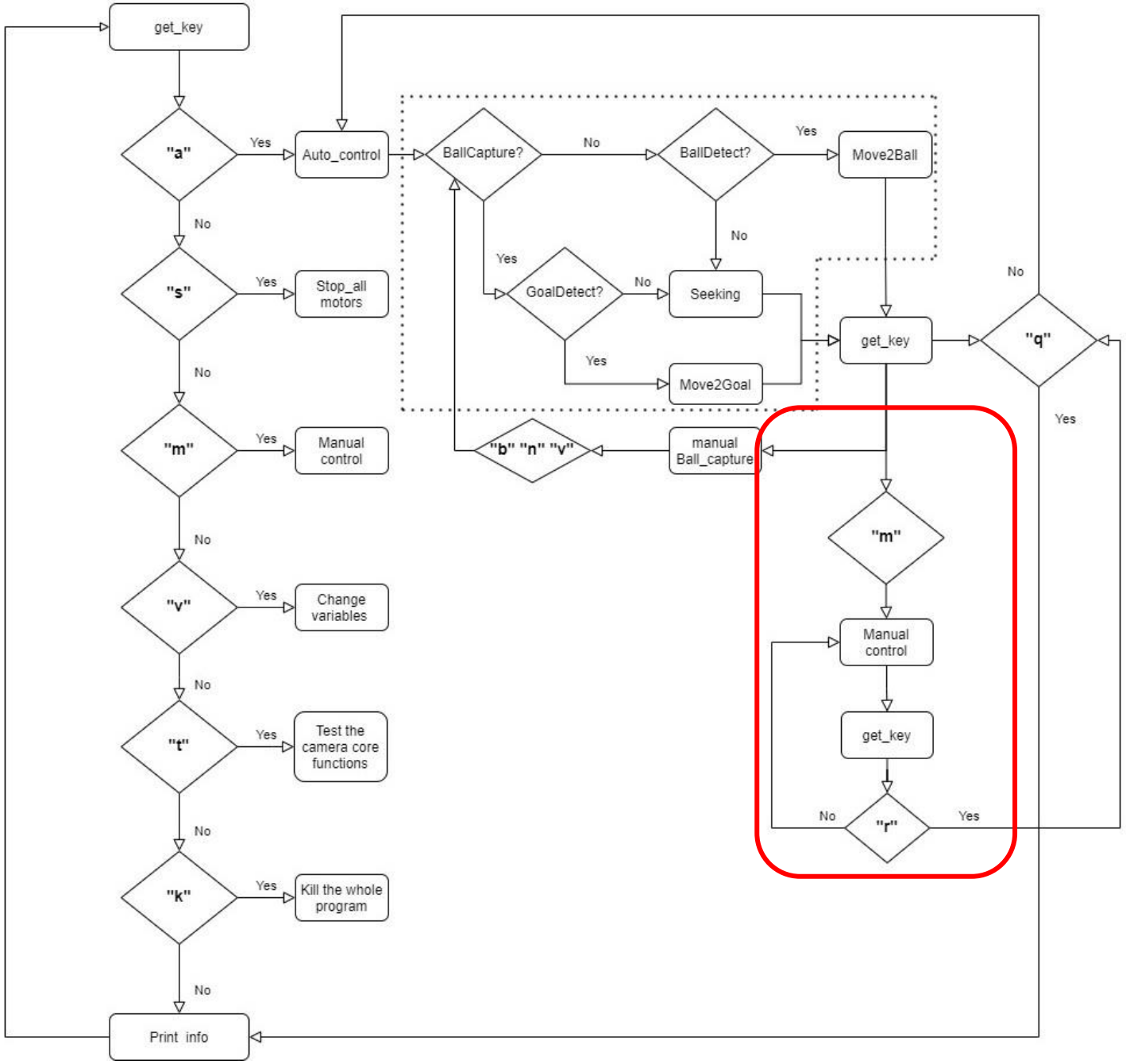
High-level logic (4)





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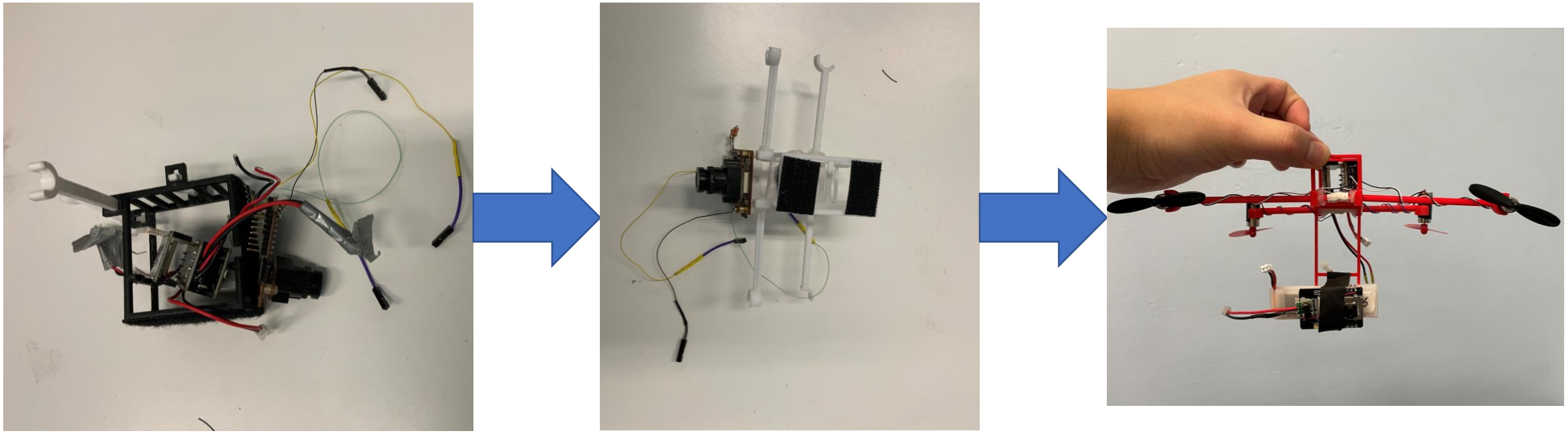
Hardware iteration



6 Weeks Summary

- **Week1:** Used color detection on OpenMV to catch the green ball in the conference room.
- **Week2:** Used the built-in AT detection algorithm on OpenMV to make our blimp bump into the AT from 6 meters away.
- **Week3:** First integrated field test failed and started to summarize the reasons and observations. Our test room was locked and we were no allow to use that space.
- **Week4:** Simplified the field test package and modularized and shift all the code to Python. Used ML algorithm and ESP32 cam to detect green ball.
- **Week5:** Used ESP32-cam and OpenMV to test the High-level logic of our python code and integrated keyboard interruption into the control.
- **Week6:** Used two ESP32-cam to do green ball detection and AT detection and finally settled down our hardware on blimp. Run several field test to test the integrated system and everything.