

INTRODUCTION

Reorientating to ideal position is one of the most interested topic for most kind of robot arm.

When falling, a cat has an innate ability to reorient mid-air to lang its feet, known as the cat-righting reflex.

This phenomenon is said that one of the best biological example of reorientation in this field.



Figure 1: How a cat and an astronaut reorientate their body

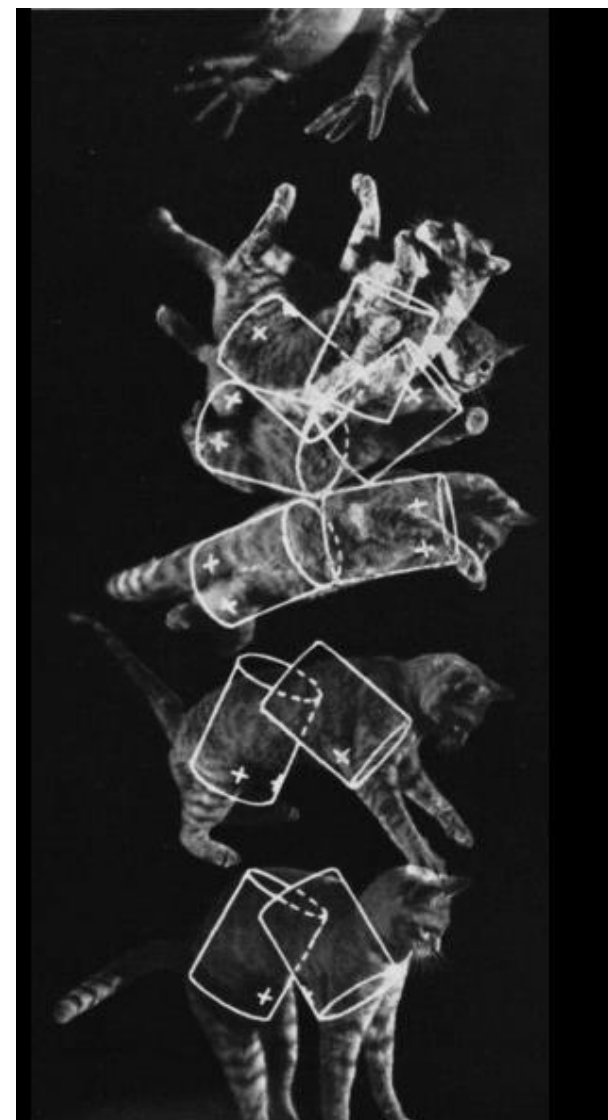


Figure 2: Assumption by Cylinder Indication

The robot should go back to an ideal trajectory which already calculated following dynamics around it. Since the time of falling is around 0.5 sec which is super quick, we need to get fast feedback.

OBJECTIVES

- Get fast and accurate feedback from falling cat robot while it's falling.

CONTACT INFORMATION

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EXPERIMENTS

- IMU and actuator sending each feedback information into micro-controller while the falling cat robot is falling. We're using a quaternion for calculating orientation since it does not has sigularity like Euler angles has.

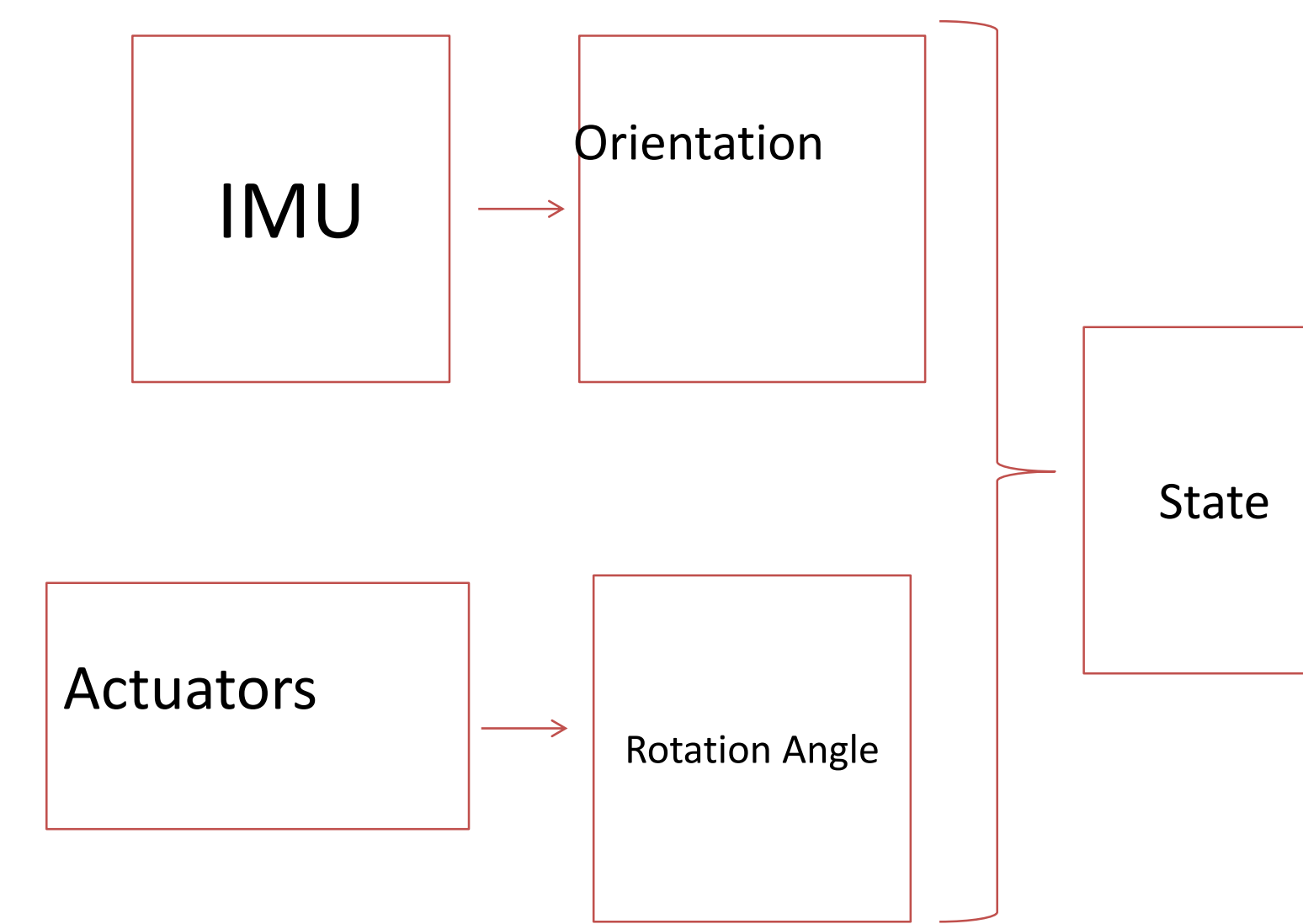


Figure 3: Diagram of Feedback

- We use a motion tracking tool called as Optitrack as a third reference of orientation in real-world. Circuit board with IMU sensor is dropped and compare an orientation from IMU data and Optitrack

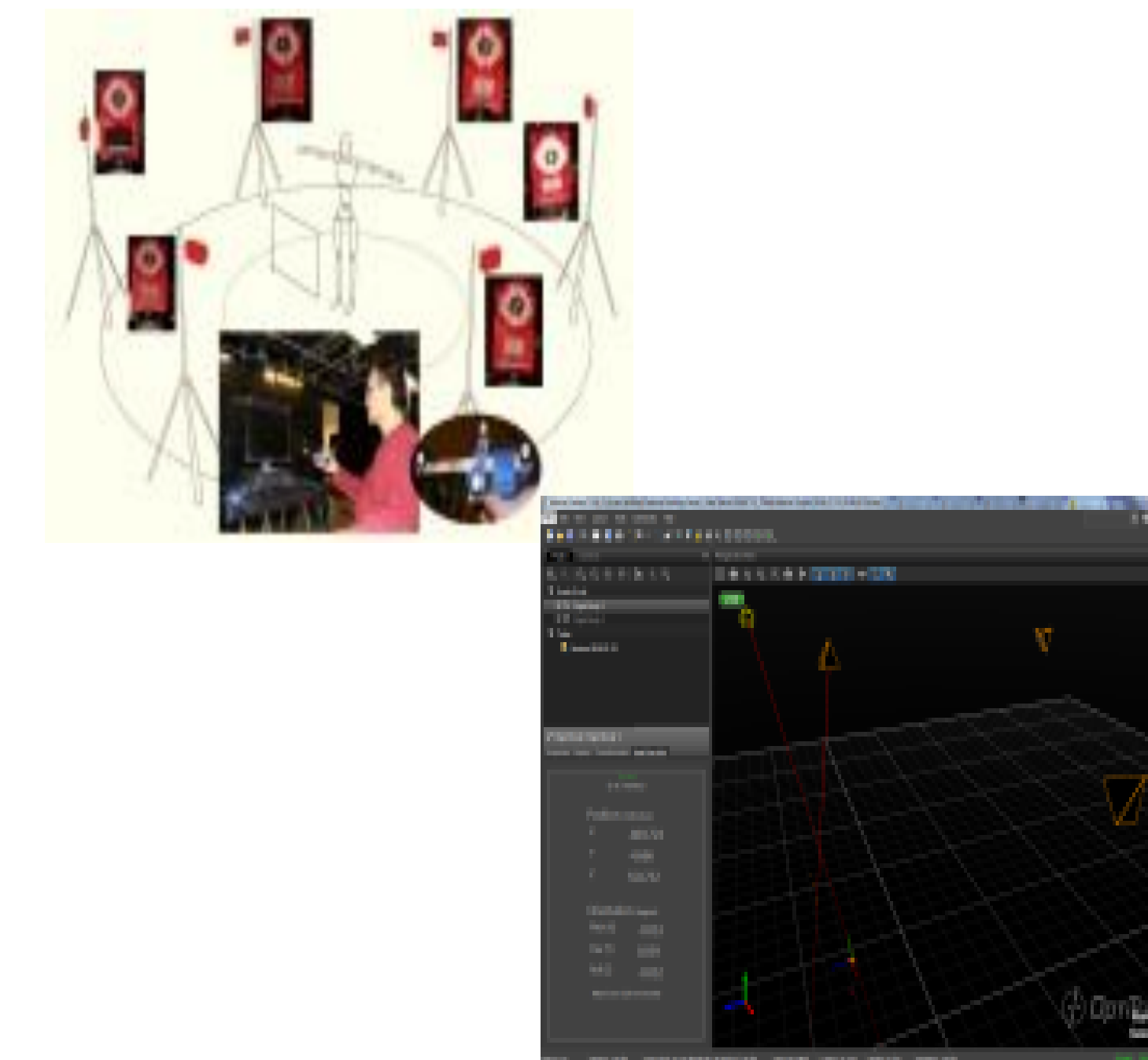


Figure 4: Display of Optitrack software and image of its usage

RESULTS

Comparing these two result of feedback., we could estimate a good orientation in terms of quaternion which is almost same as the orientation from Optitrack.

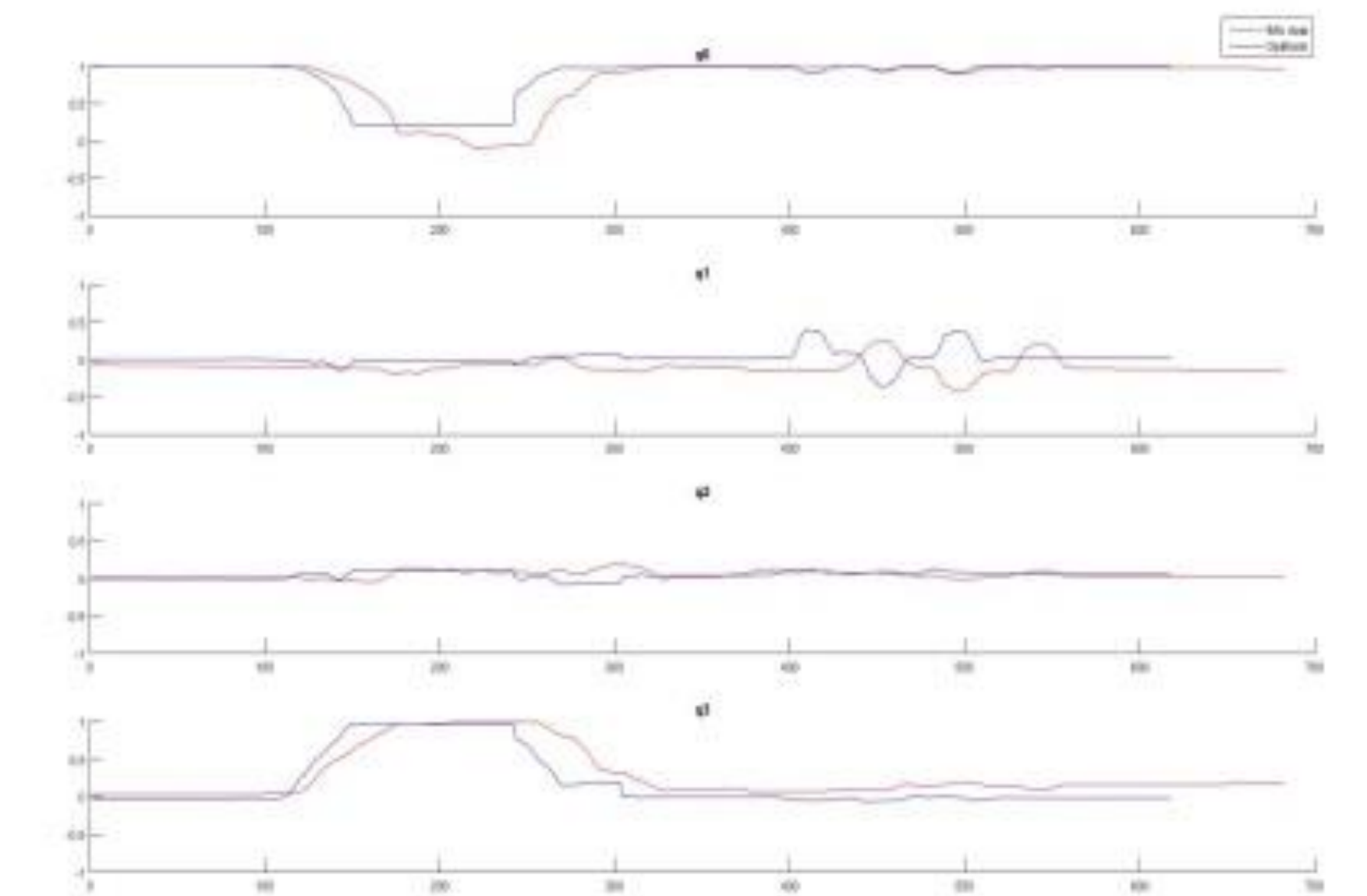


Figure 1: Feedback data from IMU sensor and Optitrack

Table 1: Comparison in terms of sample rate of feedback from IMU sensor

Process	Sample rate of previous model [us]	Sample rate of New model [us]
Get quaternion	< 7000	< 1200
Get raw IMU data	< 5000	< 1000

Also, when it comes to sample rate of getting feedback from IMU sensor, we could make it faster compared to previous model.

CONCLUSION

We could make robot got a fast and accurate feedback from IMU and actuator. Its speed is quite faster than pervious model and the orientation calculated from IMU feedback are quite accurate compared to the orientation of real-world.

FUTURE RESEARCH

- Apply a mathmatical algorithm to predict next trajectory so the falling cat robot can come back to ideal trajectory as quick as possible while it's falling.
- Add more DOF into robot for more practicability. Currently we assumed 2 DOF robot for simplifying .