Progress Presentation-I

e-Yantra Summer Intership-2016
Object Tracking Camera for Autonomous Drone

Abhishek Rathore
Gopineedi Harsha Vardhan
Mentors:
Akshat Jain
Pushkar raj
Rama kumar
Santosh

IIT Bombay

June 13, 2016

Object Tracking Camera for Autonomous Drone

- Nowadays, we get drones that say they are tracking objects. But what they actually use is the GPS location of your mobile phone. So basically what the drone is tracking is the phone and not the actual object/human. This was the reason we came up with this idea of making an Object Tracking Camera system that can be mounted on an autonomous drone. This system will track an object using Real-Time Image Processing.

Object Tracking Camera for Autonomous Drone

Abhishek Rathore
Gopineedi Harsha Vardhan
Mentors:
Akshat Jain
Pushkar raj
Rama kumar
Santosh

- **Objective**
  1. Developing an Object Tracking Algorithm
  2. Making a Gimbal system for mounting the camera
  3. Building a Pan-Tilt camera with motors
- **Deliverables**
  1. A system that can mounted on an Autonomous drone
  2. Code and Documentation
  3. Tutorials explaining individual modules

Overview of Tasks

Abhishek Rathore
Gopineedi Harsha Vardhan
Mentors:
Akshat Jain
Pushkar raj
Rama kumar
Santosh

Task No	Task	Target date
1	Deciding Components and Tutorial on "How to make your own Gimbal".	10-06-16
2	Tutorial on Colored object tracking using HSV.	07-06-16
3	Colored Object tracking (ROI selection). Tutorial on the algorithms used.	08-06-16
4	Setting up the Raspberry Pi.	12-06-16
5	Re-detection of object and Tutorial on the algorithms used.	13-06-16

Overview of Tasks

Abhishek Rathore
Gopineedi Harsha Vardhan
Mentors:
Akshat Jain
Pushkar raj
Rama kumar
Santosh

Task No	Task	Target date
6	Assembling the camera + gimbal system.	14-06-16
7	Interfacing the camera and gimbal system with the RPi.Tutorial on it	17-06-16
8	Any Object tracking (ROI selection). Tutorial on the algorithms used.	21-06-16
9	Keeping the object on the center of the screen by moving the camera.	23-06-16
10	Creating a GUI for the user to access the Object Tracking Application.	25-06-16
11	Adding features and Debugging.	29-06-16

Tasks Accomplised

Abhishek Rathore
Gopineedi Harsha Vardhan
Mentors:
Akshat Jain
Pushkar raj
Rama kumar
Santosh

- **Colored object tracking using HSV (Tutorial)**

Result: Camera tracks colored object by creating rectangle around it.

Procedure:
- Change color space from RGB to HSV
- Mask frame in range of color.
- Find the maximum area with specific color.
- Create rectangle around it.

Limitations:
- We have to give color range manually in HSV color space.
- The object should have maximum size with the color in that frame.

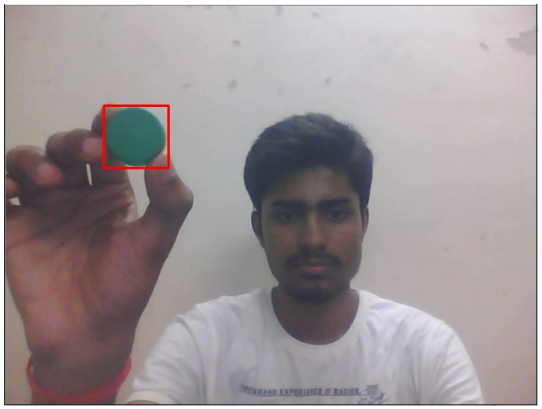

Figure: Colored object tracking using HSV.

Tasks Accomplised

- **Object tracking (ROI selection) and Tutorial on algorithm used**

Result: Camera tracks object based on ROI selection.

Procedure:
- Select ROI using Mouse Event.
- Calculate 2D Histogram of ROI.
- Calculate Back Projection of Histogram of ROI on the frame.
- Use CAMShift algorithm to find Object in Next Frame.

Limitation: Object can not be re-tracked if it goes outside frame and comes back.

Tasks Accomplised

Abhishek Rathore
Gopineedi Harsha Vardhan
Mentors:
Akshat Jain
Pushkar raj
Rama kumar
Santosh

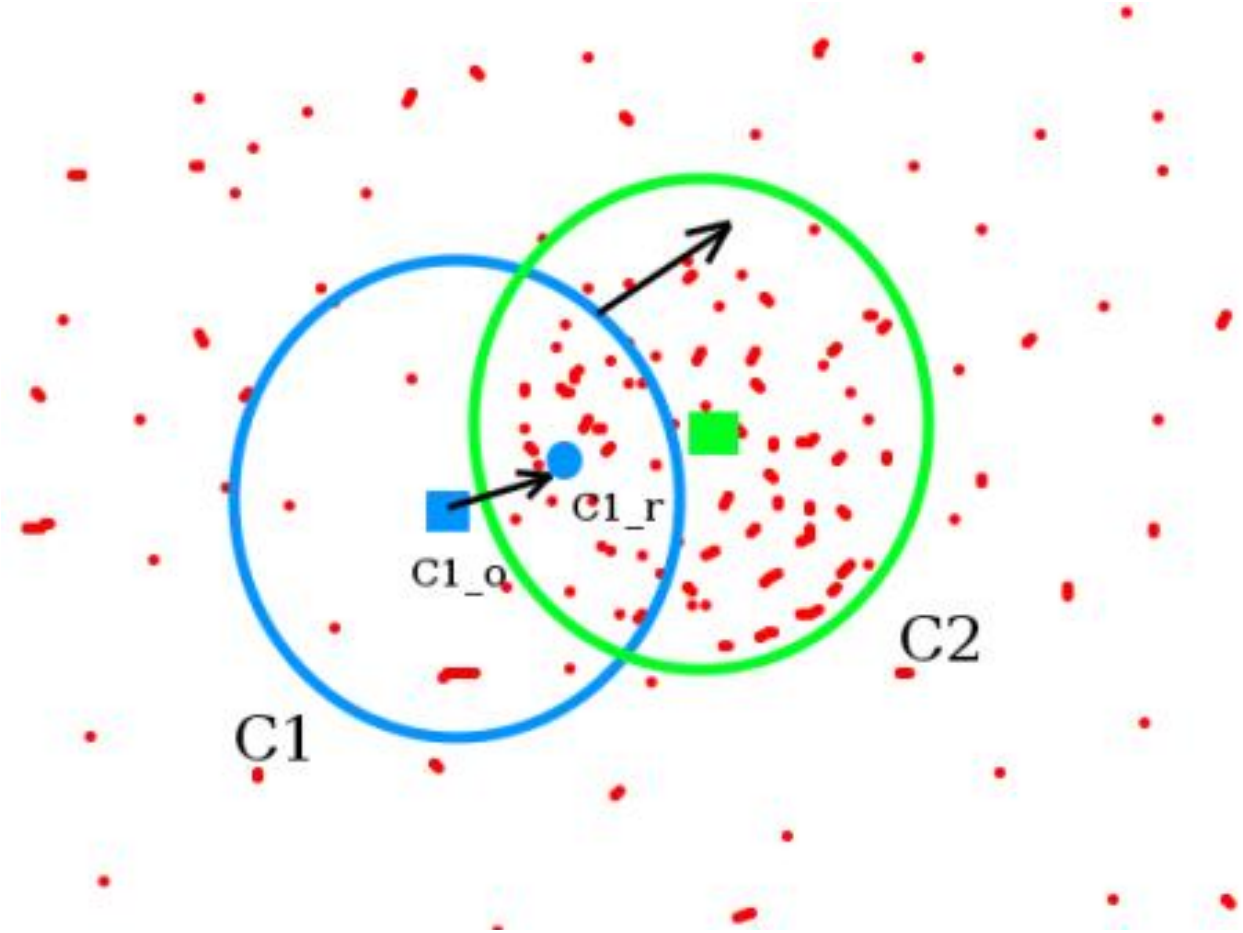

Figure: Meansift.

Tasks Accomplised

- CAMShift : It applies meanshift first. Once meanshift converges, it updates the size of the window. It also calculates the orientation of best fitting ellipse to it. Again it applies the meanshift with new scaled search window and previous window location. The process is continued until required accuracy is met.

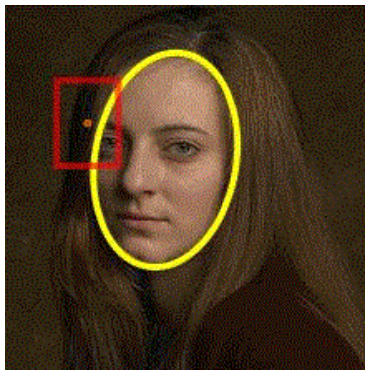

Figure: CAMShift.

Tasks Accomplised

Abhishek Rathore
Gopineedi Harsha Vardhan
Mentors:
Akshat Jain
Pushkar raj
Rama kumar
Santosh

- **Deciding Components of Gimbal and Tutorial on How to make your own Gimbal**

Components:
- Brushless DC Motors.
- Brushless Motor Controller.
- Damping Shock Absorbing Balls
- Shock Absorbing Mounts
- Gimbal Motor Frames
- Camera Fixing Mount

Processes:
- Assembling Gimbal.
- Balancing The Gimbal.

Tasks Accomplised

Abhishek Rathore
Gopineedi Harsha Vardhan
Mentors:
Akshat Jain
Pushkar raj
Rama kumar
Santosh

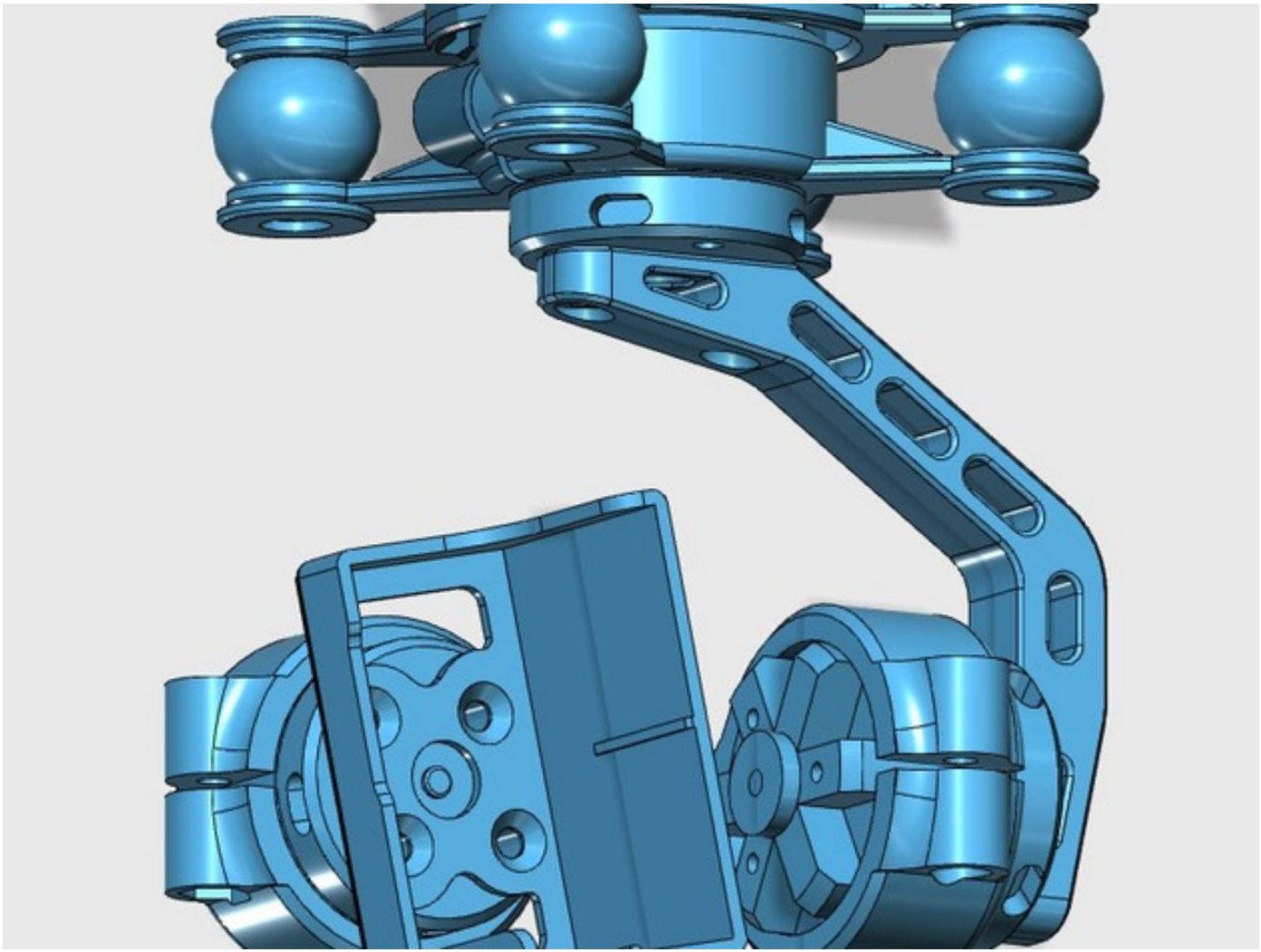

Figure: An assumption of final gimbal.

Tasks Accomplised

Abhishek Rathore
Gopineedi Harsha Vardhan
Mentors:
Akshat Jain
Pushkar raj
Rama kumar
Santosh

- **Setting up the Raspberry Pi**
  - Installed Rasbian OS.
  - Installed OpenCV Library.
  - Installed other libraries for image processing..

Challenges Faced

Abhishek Rathore
Gopineedi Harsha Vardhan
Mentors:
Akshat Jain
Pushkar raj
Rama kumar
Santosh

- Making Gimbal with weight constraints and deciding parts.
- Selection of a compatible camera.
- Tracking of object when the orientation of the object is changed.

Future Plans

Abhishek Rathore
Gopineedi Harsha Vardhan
Mentors:
Akshat Jain
Pushkar raj
Rama kumar
Santosh

- Re-detection of object and Tutorial on algorithms used.
- Assembling the camera + gimbal system and interfacing them with the R-Pi.
- Keeping the object on the center of the screen by moving the camera.
- Object tracking using Pan-tilt camera system.

Thank You

Abhishek Rathore
Gopineedi Harsha Vardhan
Mentors:
Akshat Jain
Pushkar raj
Rama kumar
Santosh

THANK YOU !!!