



## **Team G- Robographers**

**Progress Review 2**

**Individual Lab Report 3**

**Jimit Gandhi**

**Team Members**

**Rohit Dashrathi**

**Sida Wang**

**Gauri Gandhi**

**Tiffany May**

## 1.0 Introduction

The name of our team is Robographers. The effort of the team is to design a project of group of robots that will click pictures collectively based on the readings of the expressions (smile) of the people in the party or any event. By this project we will be establishing the fact that a group of swarm robots can detect and perform photography with more robustness and effectiveness than a single robot system.

## 2.0 Individual Progress and Contribution .

The goals for our Progress Review 2 were as follows

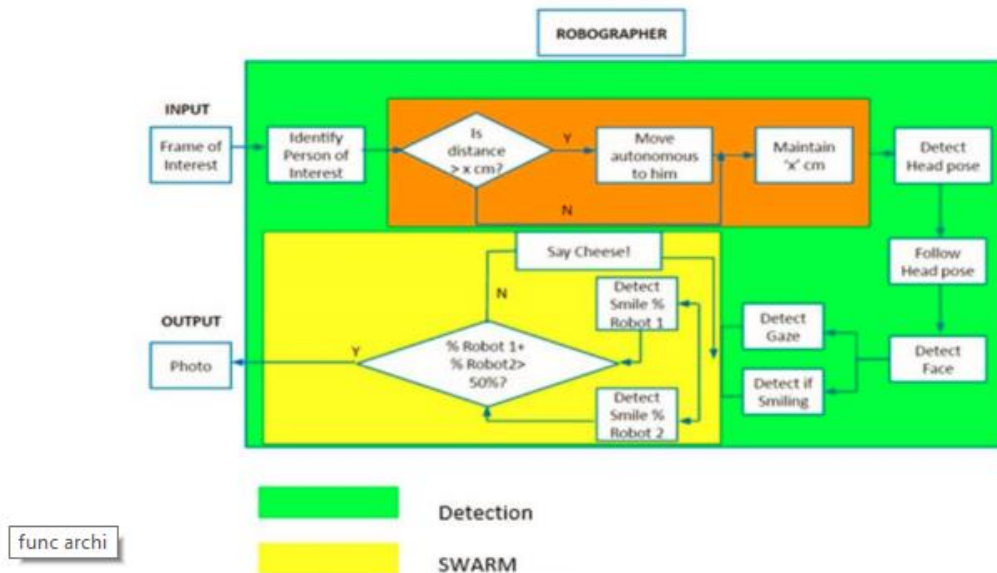
1. Familiarize and Demonstrate Intraface software.
2. Build a working prototype of 3D pan tilt unit with servo motors.
3. Calibrate the Turtle Bot.
4. Make Schedule for collaboration subsystem.
5. Redesign the functional architecture (This was not mentioned as a milestone but we had to revisit and make the changes. Reasons will be explained below.)

I mainly worked on making collaboration subsystem schedule. The planning aspect of collaboration subsystem will be executed in Spring since our Fall validation experiment is mainly demonstrating the capability of a single robot system. However, the collaborative detection will be implemented and tested by Fall end. I have separated the main task of multi face expression recognition. The first part of the task is to reconstruct an image or a face using multiple view. For this we will need to calibrate the different cameras (we plan to work on 2 or 3 cameras). As we witnessed in the demonstration that Intraface detects the expression of any person in the video frame but not the person we intend to detect. So we plan to explore ways to tackle this problem by filtering the frame and sending the input to the Intraface, only the facial image of the person we intend to detect. For this we are trying to contact the personnel of Human Sensing Lab who developed the software to gather more information on the working of Intraface. The tentative collaboration schedule is attached below. These tasks may be modified according to the requirements of Intraface.

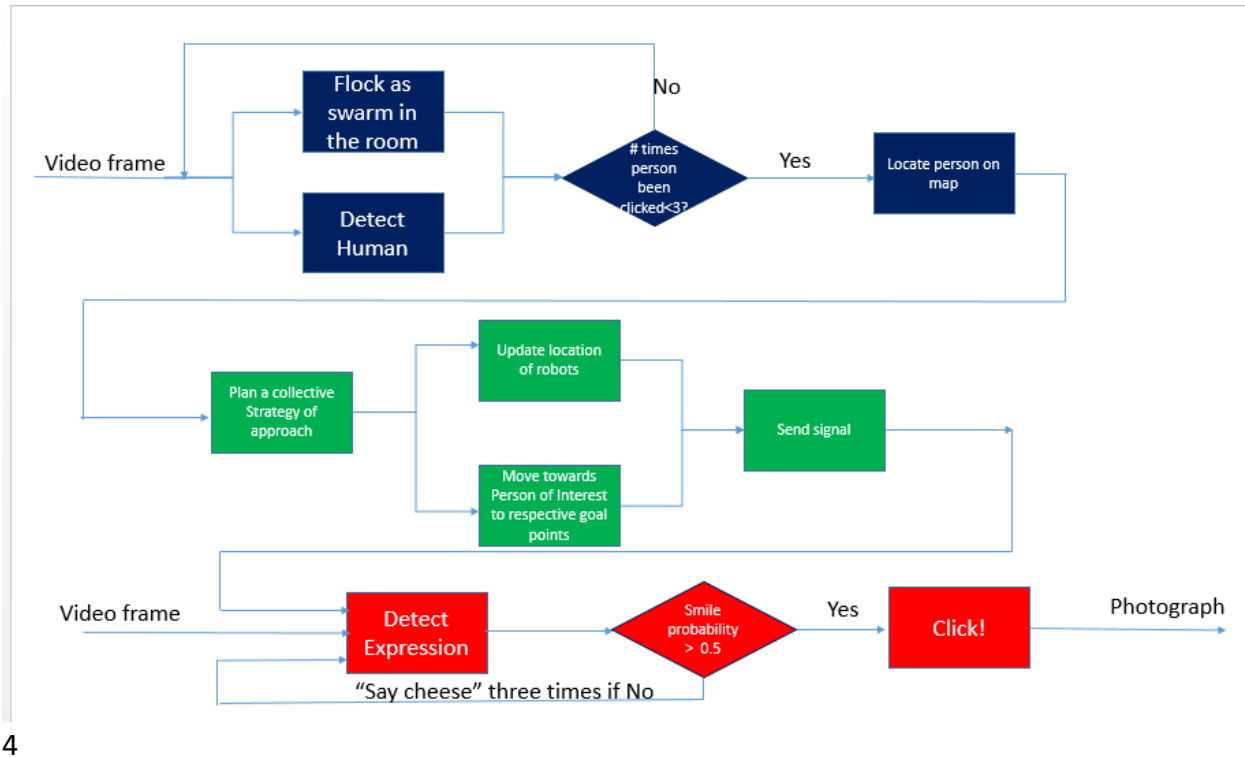
	A	B	C	D
1	Collaboration Schedule			
2	Task	Subtask	Dates allotted	
3	Facial expression recognition with Intraface	Literature review	22 oct -27 oct	
4	using multiple camera			
5		3D reconstruction from different views	6-Nov	10-Nov
6		multiview facial reconstruction by multiple came	17-Nov	26-Nov
7		Image compression for communication	7-Dec	15-Dec
8	Collaborative planning	Implement flocking behaviour	12-Nov	17-Nov
9		Expression recognition using multiple camera	2-Dec	7-Dec
10		Explore map using flocking	27-Nov	1-Dec
11	Design, simulate and implement algorithm to follow head pose collaboratively		January	
12	Implementating cost function for overall expression reading		January	
13	Design, implementation and testing of best angle algorithm			
14				

**Figure 1: Collaboration Schedule**

I made some major changes in the Functional architecture. I am attaching the older version of the functional architecture along with the new version. This new version is the result of the iterative brainstorming with the MRSD Director, Teaching Assistants as well as their feedback in the CODR. The functional architecture had several inconsistencies and thus I had to re-think over it keeping the requirements of the project in mind. Note that there is no change in the major mandatory requirements yet.



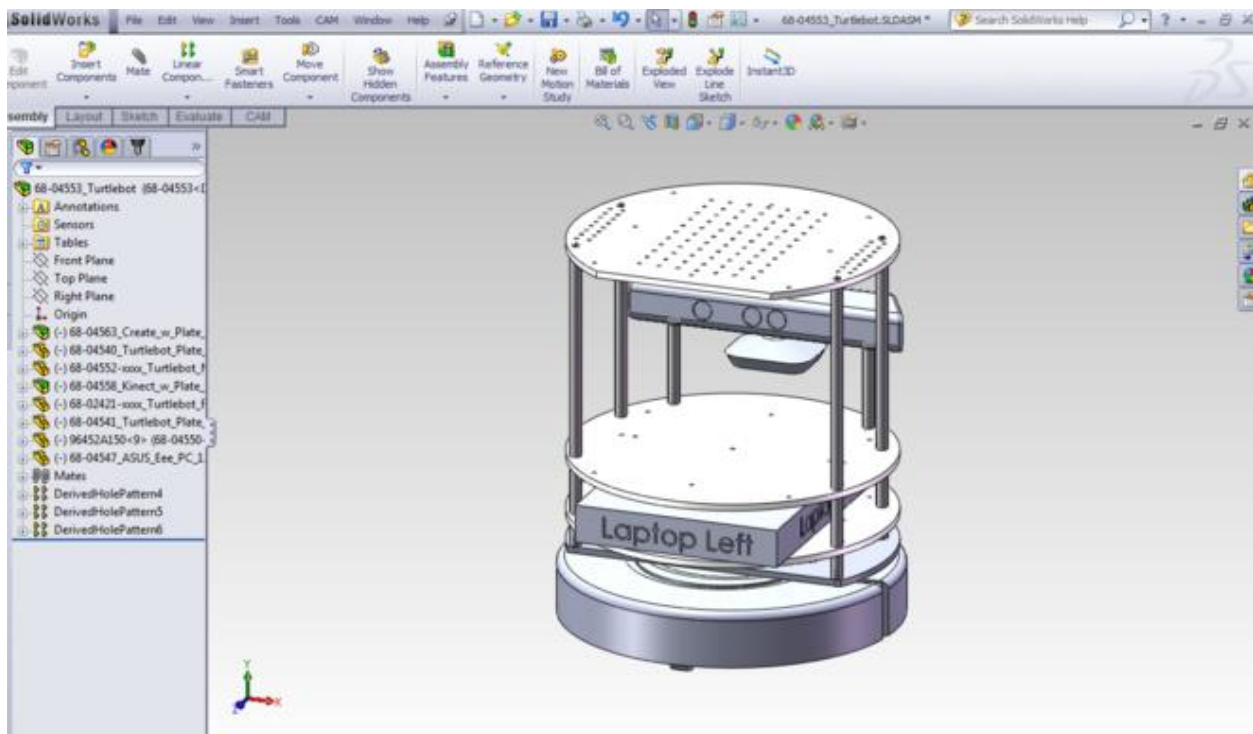
**Figure 2: First functional architecture**



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**Figure 3. Revised Functional Architecture**

Apart from the major tasks I did, I also assisted my team mates wherever I could. Rohit had built a 3D pan tilt model on SolidWorks. Once I sent the file to him he merged his pan tilt model with the Turtle bot model. I also helped Gauri with the network setup of the Turtle bot in the lab although majority of the work was done by her.



**Figure 4: Turtle bot SolidWorks Model**



**Figure 5: Turtle Bot top view at Advanced Agents Lab**



**Figure 6: Turtle Bot affine view at Advanced Agents Lab**

## **2.1 Challenges Faced**

The challenges that concern me is still that we have no control over the Intraface[1]. So we may have to design our system around the working of the Intraface[1]. Another major challenge that I found was the inexperience of any member of the team with ROS. So following week I plan to focus on the working and gaining expertise in ROS. I plan to read a textbook on ROS called 'A Gentle Introduction to ROS by Jason O'Kane [2] which I have already begun and soon get in-depth technical know how to operate TurtleBot on ROS.

## **3.0 Team Work**

Rohit worked on 3D printing the parts of pan tilt unit and actuating them with servos. Gauri started to get acquainted with the Turtle bots network setup which she successfully completed. Sida and Tiffany managed to fix the bug of Intraface ROS package they faced earlier and are planning to go deeper to know how it works.

## **3.1 Future Work**

We plan to move as per our work breakdown structure. Next week's agenda includes the following.

1. Get more familiarized with Intraface by Sida, Tiffany and Jimit
2. Understand how to program turtle bot with ROS by Gauri Rohit and Jimit.
3. Multi camera calibration and reconstruction by Jimit.

## 4.0 References

1. Intraface Software - Fernando De la Torre<sup>†</sup> , Wen-Sheng Chu<sup>†</sup> , Xuehan Xiong<sup>†</sup> , Francisco Vicente<sup>†</sup> , Xiaoyu Ding<sup>†</sup> , Jeffrey Cohn<sup>†‡</sup> <sup>†</sup>Robotics Institute, Carnegie Mellon University, (<http://www.humansensing.cs.cmu.edu/intraface/>)
2. A gentle Introduction to ROS <https://cse.sc.edu/~jokane/agitr/>