RoboGrapher

Task 0: System Design Review

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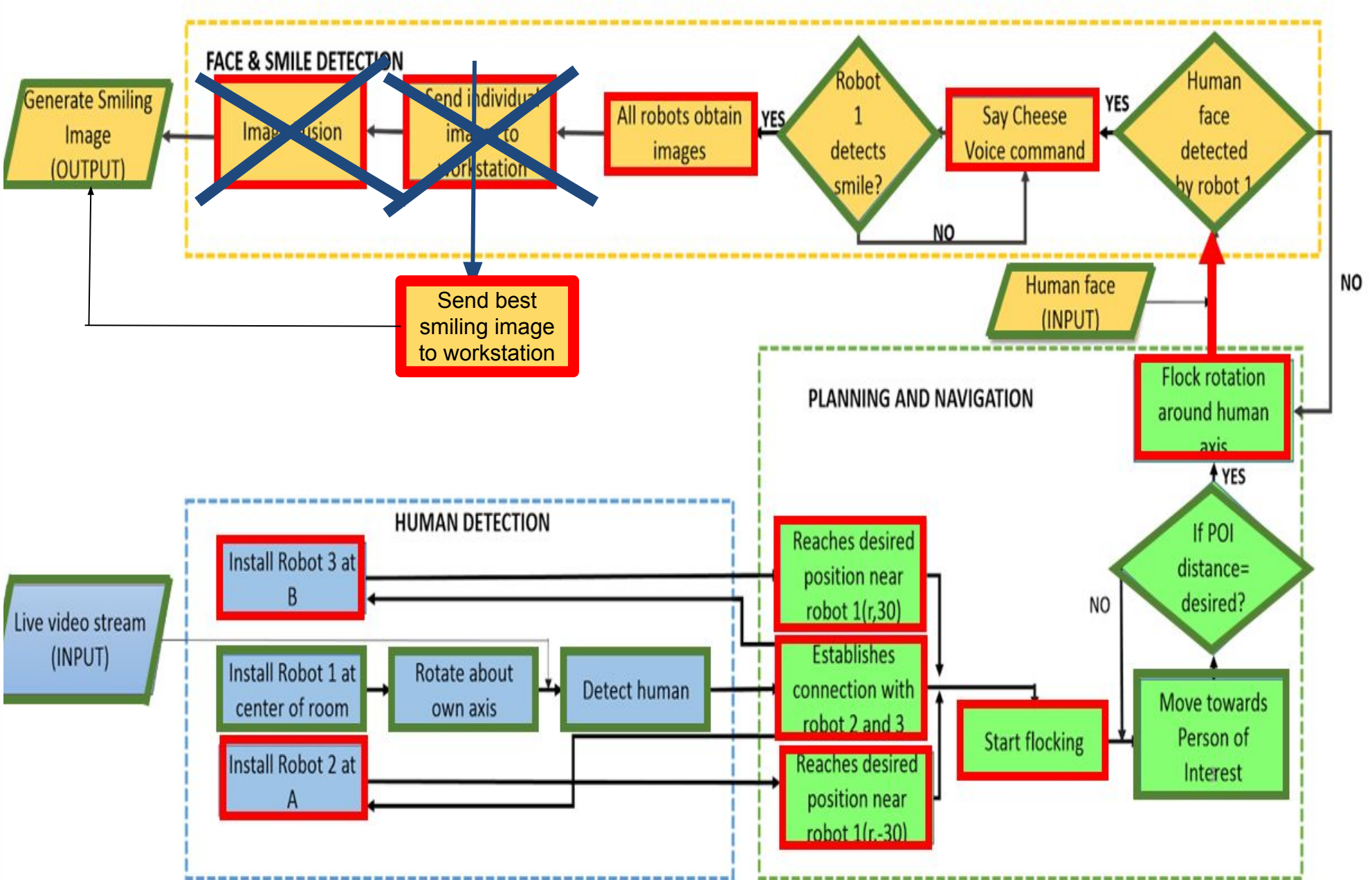
Work to Do!

1. Integration: 1 robot system
2. Photo clicking
3. Swarm navigation
4. Swarm communication
5. Collaborative photo clicking
6. Testing

Functional Arch (Rev 5)



Challenges

- 1. Intraface: Image processing + Zoom
- 2. Flocking → Stability & localization
- 3. Noisy data for navigation: camera vibrates
- 4. Obstacle avoidance, occlusion

Challenges (Contd)

INTRAFACE behavior:

- Challenge: Processes the input so that the frame input to intraface only contains face of person.
- Solution: Buy camera of HD quality with zoom for less noisy stream and better control over Intraface so that it detects only the desired face using the zoom and auto focus feature

Slow Hardware :

- Challenge: Current master computers are old, slow/non working. Affects the system performance
- Solution: Buy new hardware (Trade study completed for Chromebooks).

Identifying the Purpose of swarm utilization

- Challenge:Requirement to be fulfilled-Facial expression recognition using multiple robots.
- Suggestion: robots will place itself at +30 -30 and 0 relative to april tag orientation of the person and try to analyse the expression

Trade Study (Camera)

Selected

Parameters	Level	Weight Factor	Logitech HD pro c920	Logitech HD c615	Genius widecam F100	HP HD 4310	Brother NW-1000
Price (Lesser the better)	4	0.75	4	3	6	5	1
ZOOM (More the better)	4	1	10	0	0	0	7.5
Compatibility with linux	1	1.75	10	10	10	10	0
Video Speed	4	1	10	5	10	10	10
Resolution pixel (More the better)	3	1.25	10	6	8	8	6
AutoFocus	3	1.25	10	10	5	10	10
Face tracking by itself	2	1.5	10	0	0	0	0
Face recognition by itself	2	1.5	10	0	0	0	0
TOTAL		10	9.55	4.475	4.825	5.375	3.825

Trade Study (Master Comp)

Selected

Parameters	Weight Factor	Asus netbook Eee_PC_1025Ce	hp chrome book 11 G4	hp chromebook 14 G3	Toshiba chromebook 2	Acer Chrome book 11	Acer Chrome book 11 (C720-7404)
Price (Lesser the better)	1.5	5	8	8	6	9	5
Weight	0.75	10	10	2.5	7.5	10	10
Memory	1	8.75	1.25	1.25	1.25	1.25	2.5
RAM	1.5	5	7.5	5	7.5	5	7.5
Ubuntu compatibility (processor type, ARM/Intel)	1.75	10	10	0	10	10	10
Battery life	0.75	8.75	2	1.25	3.75	3.75	2.5
Display size	0.75	10	8	5	6	8	8
Processor spec	1	2	2	2	2	2	6
TOTAL	9.00	7.20	6.56	3.26	5.99	6.45	6.68

Spending Plan

Sr. No	Item	Description	Unit price (USD)	Req. Qty	Back up Qty	Total Qty	Total price (USD)
1	Camera	Logitech HD pro c920	65	1	1	2	130
2	Laptop	Acer Chromebook 11 (C720-7404)	358	3	0	3	1074
3	Battery (For PDB)	To be finalised after PDB redesigning.	-	-	-	-	-
4	Power Distribution Board	Redesigning. To be ordered from www. emchineshop.com	-	3	3	-	-
5	PTZ child parts (Al 6061)	Quote awaited from www.emachineshop.com	-	1 set	1 set	-	-
						TOTAL	1204

Tentative Test Plan

#PR7 **Single Robot System: Full Integration**.

Goal: Be able to detect the person, move towards him, capture expression and click the photo if smiling

#PR8 **3 Robot Flock Formation and improve expression detection subsystem.**

Goal: Be able to move from point A to point B (coordinates to be provided by April tag or User).

Improve Intraface output to get the desired expression in case of multiple faces

#PR9 **SWARM communication improvement**

Goal : Communication between robots will be synchronized to have no concurrency or dead-locks, delays.

#PR10 **Accurate SWARM self-arrangement around human (-30,0,30) degree**

Goal:The swarm should locate human and position themselves around the human to detect the human's expression irrespective of the head pose.

Atleast one robot should be able to detect expressions of the human at any point of time

#PR11 **Testing of SWARM system**

Goal:The entire system made autonomous from detection of human to photo-clicking to detection of another human after one initial launch.

Find a way to mitigate scenarios of occlusion, presence of multiple person in a frame affecting efficiency

#PR12 **Validate requirements and Troubleshooting**

Goal: Check for unfulfilled requirements. Fulfill them. Document all the test results to see how the system works in different scenarios (such as failure of one robot), battery drain

SVE

Description- Autonomous human detection by 3 robot SWARM, detect the face & expression, click a photograph if he/she is smiling.

Set-up- 3 turtle bots with pan tilt camera units. One person standing in environment.

Location: Advanced Agents Lab.Level 1, Newell Simon Hall.

Procedure-

1. A lead turtle bot rotates in its place, detects April tag mounted on the human.
2. Sends human location to other Turtle bots
3. System navigates to desired position as a group (2 meter from Human)
4. Break formation and place themselves around human at every (-30, 0 ,30) with respect to the April tag orientation and at 1 meter from the person.
5. System collectively tracks the headpose and finds the expression reading of the human
6. One turtle bot with highest smile reading will click the photo
7. Photo is sent to the remote laptop workstation.

THANK YOU!

QUESTIONS?