



Camerazzi

Mimi Niou, Cornelia Chow, Adriel Joseph Mendoza

Team B3

USE CASE

What problem area are you trying to improve?

Autonomous robotic photographer

- Comfortable/unintrusive
- Consistent/unbiased
- Available
- Reliable
- Instant access to photos

Core Areas

Hardware

Software

REQUIREMENTS

What are the requirements of your project?

Roaming Camerabot will:

- Detect faces
- Capture photos of faces
- Adjust position for ideal image capture
- Send photos over wifi
- Detect bodies
- Autonomously roam an area

Roaming Camerabot will NOT:

- Bump into humans
- Fall down stairs

CHALLENGES

What are the key technical challenges?

- Accurate body sensing
 - Widening field of view of thermal sensor
- Adjusting Roomba's position for image capture
- Wireless photo transfer
- Adjusting height of camera
- Durable robot structure



CHALLENGES

How will your approach meet those challenges?

- Individual component testing
- Multiple approaches for different challenges
- Focus on basic features for MVP

SOLUTION APPROACH

How will your project fulfill your requirements?

Hardware:

- iRobot Create 2
- Raspberry Pi 3 Model B+
 - CSI camera port
 - 4 usb ports
 - wireless LAN
 - more RAM than other models
- Raspberry Pi Camera Module
 - easy integration with RPi
 - 8MP pictures
- Adafruit AMG8833 8x8 Thermal Camera Sensor
 - easy integration with RPi
 - detect human from a distance of up to 23 ft



SOLUTION APPROACH

How will your project fulfill your requirements?

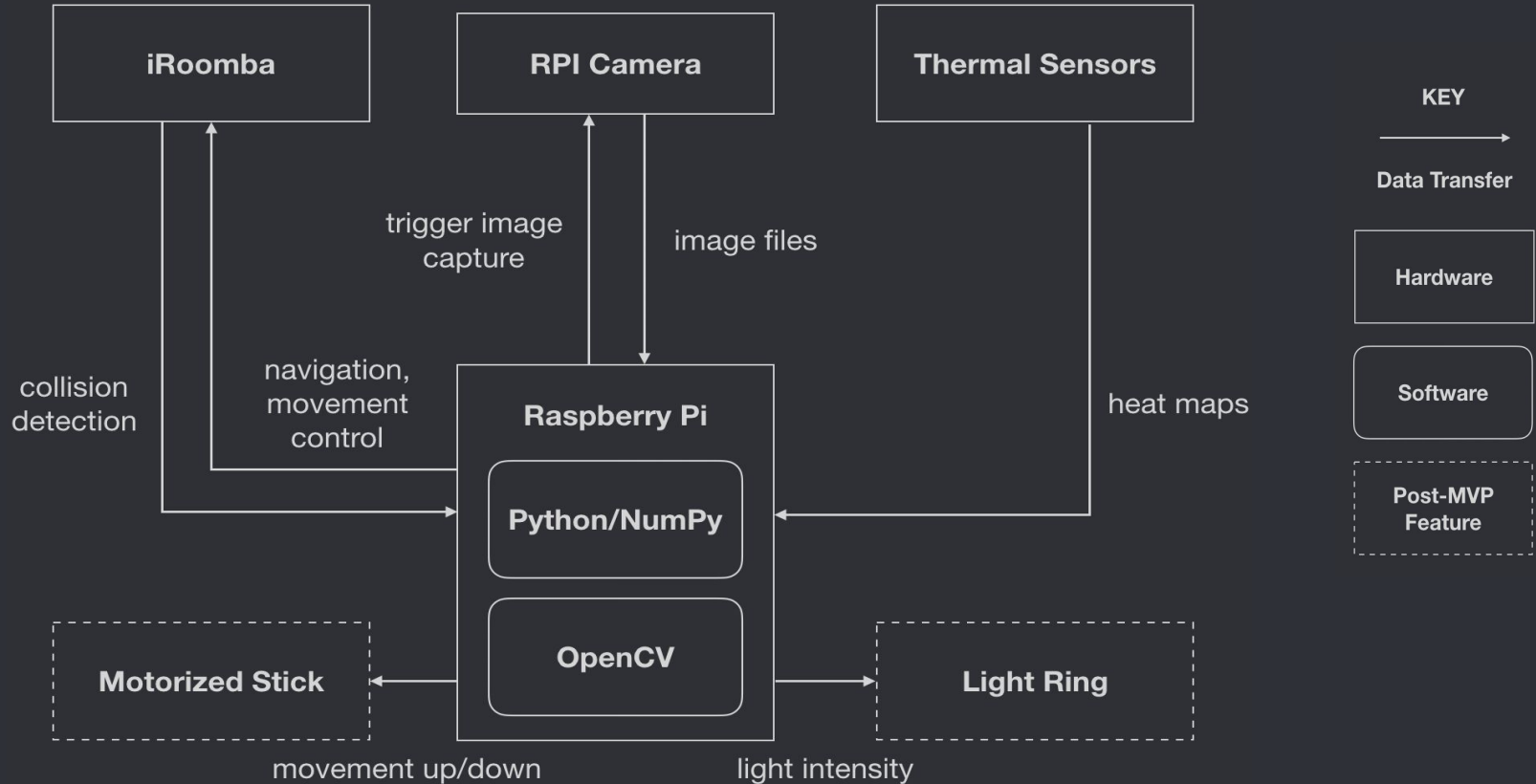
Software:

- Python/NumPy/OpenCV for face detection
- Raspbian OS for RPi setup
- Python for thermal camera sensor and Roomba movement

Communication between components:

→ block diagram

BLOCK DIAGRAM



TESTING, VERIFICATION, & METRICS

How will you measure the success of your product?

Tested feature	Metric	Success value
Face detection	Percentage of faces detected corrected in real time	90%+
Photo capture	Percentage of photos with faces	80%+
Image quality	Moves to optimal position to ensure image margins	5%+ margin above tallest head
Collision detection	Distance from human when it's detected	At least 3 ft away
Roomba movement	Distance from a body Roomba stops	At least 1 ft away
Image transfer	Images wirelessly transferred to designated folders	100%

TASKS AND DIVISION OF LABOR

Mimi

Software

- Raspberry Pi
 - Face detection
 - Thermal detection
 - Image capture

Cornelia

Software/Embedded

- Raspberry Pi
 - Roomba movement
 - Processing thermal data and face detection

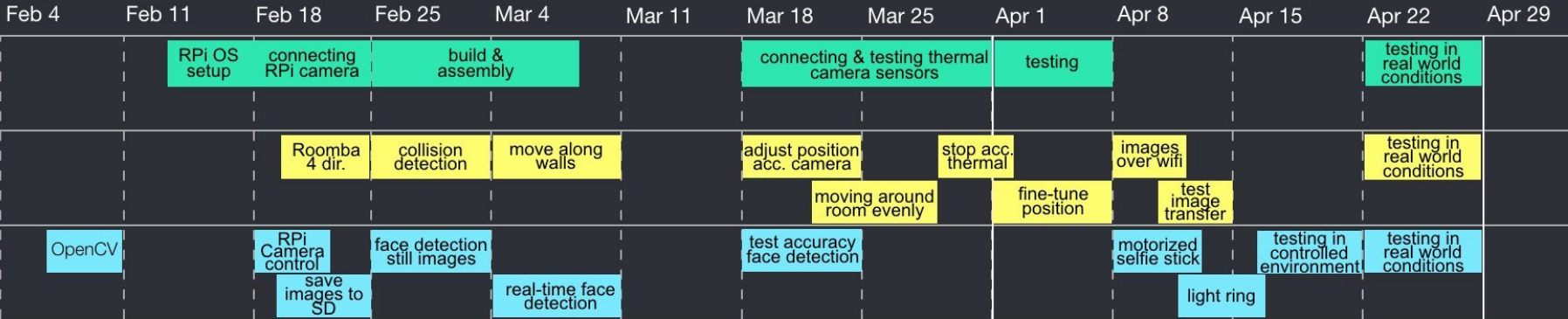
Adriel

Hardware/Embedded

- Set up RPi OS
- Module connections and powering components
- Robot assembly
- Camera mechanics

SCHEDULE

2019



midsemester demo

final demo

Cameraazi

February 2019

March 2019

April 2019

5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 4 5 6 7 8 9 10

Logistics

- Order parts
- Receive parts
- Design Presentation
- Spring Break
- Working MVP
- In-lab Demo
- Final Presentation
- Final Report Due

Assembly

- Attach tripod
- Build case for camera, rpi, battery
- Attach case to tripod
- Final assembly
- Test durability

Thermal Camera

- Connect to rpi to send heat data
- Test human detection

RPI Camera

- Connect to rpi (power)

Raspberry Pi (Setup)

- Set up environment (Raspbian OS)
- Connect to battery pack

Raspberry Pi (roomba movement)

- Control roomba movement (4 direct...
- Program roomba for collision detecti...
- Program roomba to move along walls
- Program roomba to adjust position f...
- Program roomba to move around ro...
- Program roomba to stop when body ...
- Finetune adjustments for image capt...
- Test roomba movement

Raspberry Pi (image transfer)

- Program images to send over wifi
- Test image transfer (speed, reliability)

Raspberry Pi (face detection)

- Learn opencv
- Set up opencv face detection on rpi (...)
- Realtime face detection on rpi w/ rpi ...
- Test accuracy

Raspberry Pi (camera control)

- Trigger image capture
- Save images to sd card

Testing (MVP)

- Testing in controlled environment
- Testing in real world conditions

Additional Features

- Motorized selfie stick
- Light ring

