Team E5
COMOVO: Control, Motion, Voice

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Use Case

- Video calling during a family dinner
    - Especially suited for when more than one person is talking at once
- Manual: you can rotate the camera to wherever you want
- Automatic: the camera rotates towards the person speaking the loudest/indicates they are speaking to the person on the call

Comparative Advantage

Existing Products:

- Facebook Portal:
  1. Expensive
  2. Less mobile (not for phone)
  3. Limited to Facebook video calling platforms
- Zoom, Webex... :
  1. Not for personal use
  2. Cannot handle multiple sources of sound

Our Product:

- Cheaper
- Portable small rotating platform
- Platform independent
- For personal use
- Gives users control of other camera
- Sound localization capability with multiple sound sources

Requirements

1. A platform with a notch to hold a phone and connect to servo motor
2. Communicate between two COMOVO devices through cloud
    a. Send motion sensor data to cloud, process it and send that to other device.
3. Be able to control the paired device manually and automatically
    a. Manual: control the paired device through hand motions.
    b. Automatic: paired device rotates towards loudest speaker.
4. Switch between manual and automatic modes

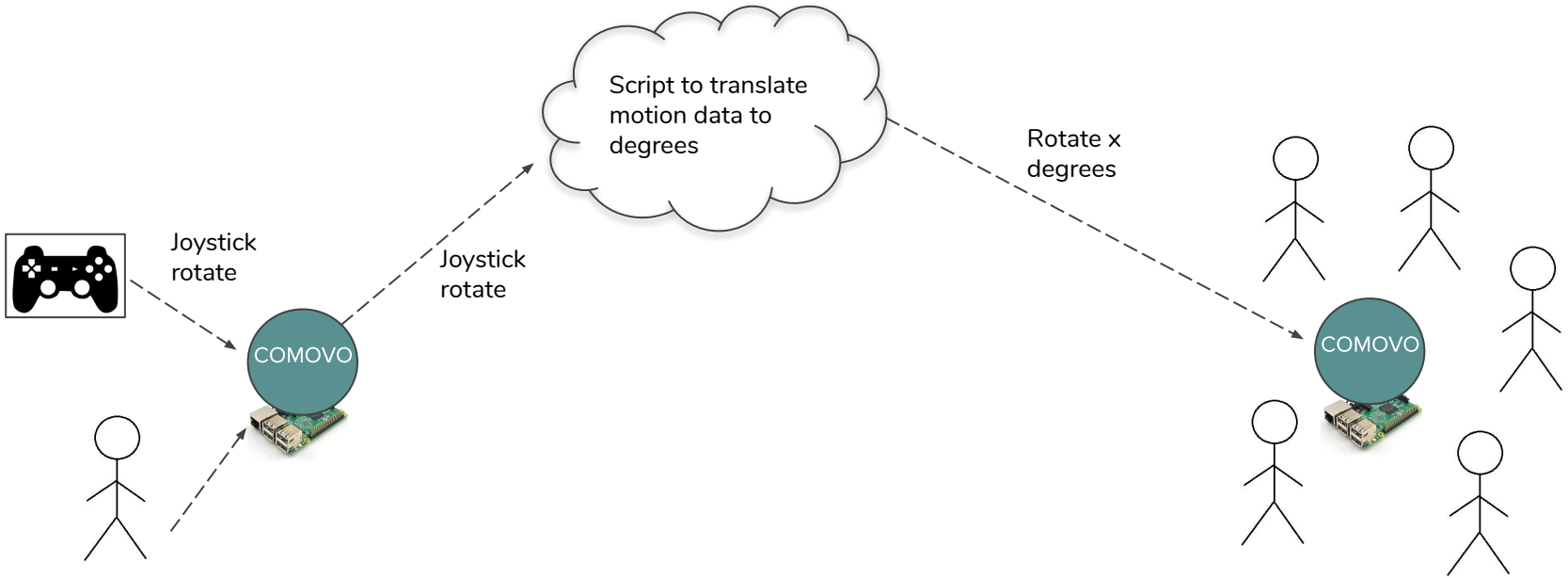
Solution Approach: Hardware

- Raspberry Pis
  - Preferably small
  - USB ports for video game controller
  - GPIO pin for servo motor control
  - Motion sensor input
  - Microphone input
- Servo motors
- Microphones
- Motion sensors

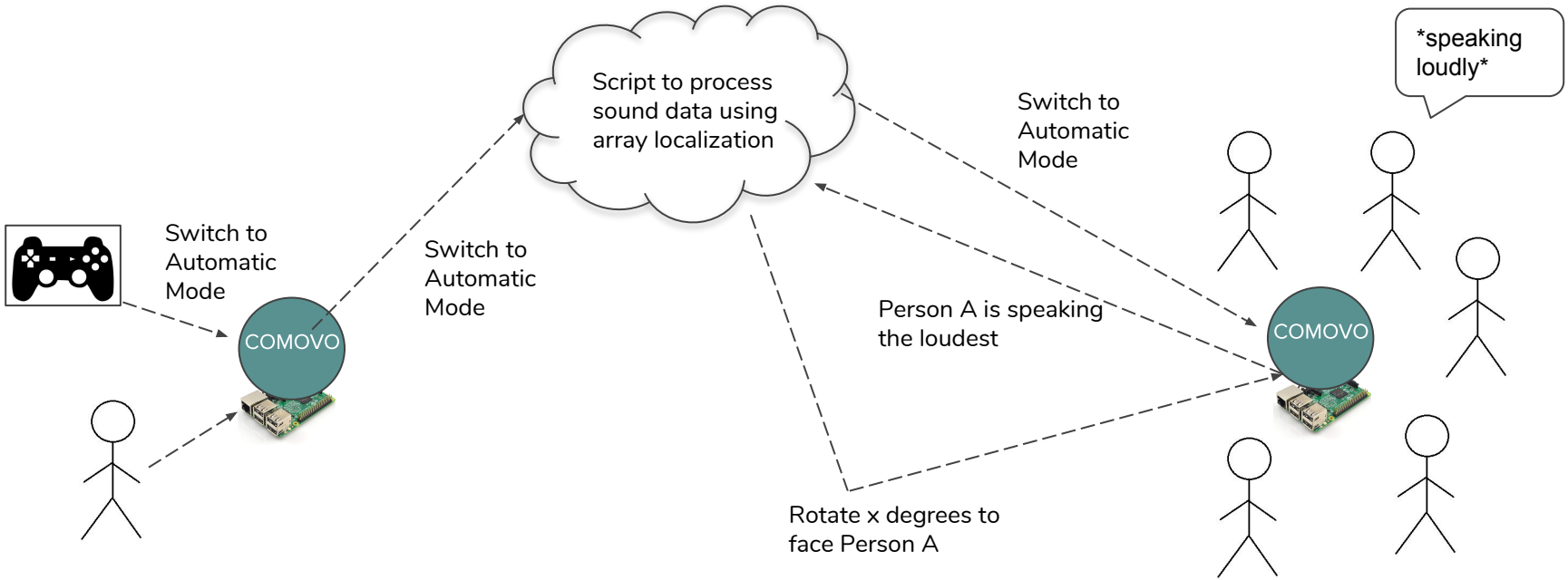
Solution Approach: Software

- Software to process motion data and convert it to degrees
- AWS EC2 server
- Writing the required drivers for RPi (UART, I2C, ADC)
- Motion sensor data processing library
- Sound signal processing library to localize source
- Software to run on AWS server that will decide course of action

Solution Approach: Manual



Solution Approach: Automatic



Testing, Verification & Metrics

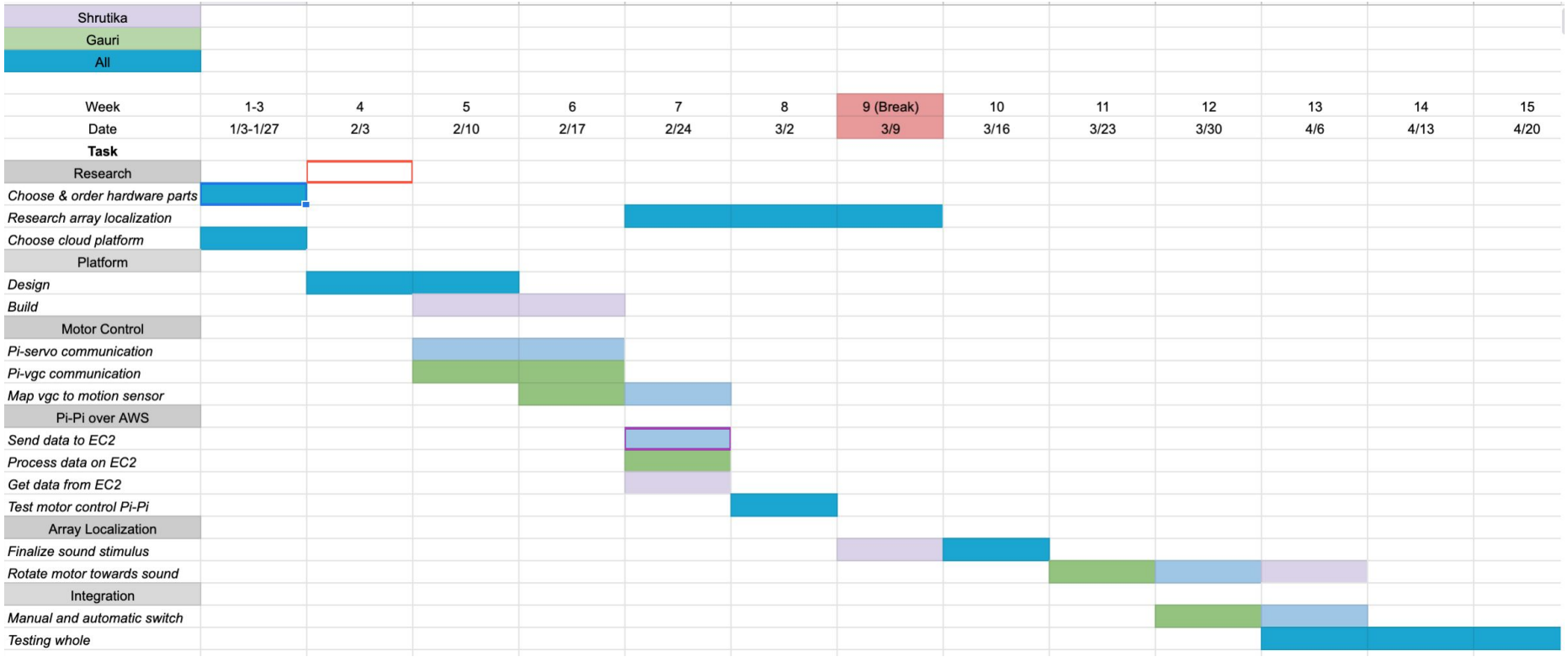
M = Manual only, A = Automatic only

Feature	Metric	Success Values
(M) Motion Detection	% accuracy of motion detection	85%+
(M) Latency	Time taken to receive, process, and execute command	Begin rotating in < 2.3s
(A) Accuracy of ‘loudest speaker’ detection	% times COMOVO rotates to loudest speaker with one person speaking at a time	85%+
(A) Distance of people speaking from COMOVO	Distance in feet	~ 3ft
(M) Distance of person motioning from COMOVO	Distance in feet	< 3ft

Challenges

- Understanding and implementing array localization
- Mapping motions from motion sensor data to video game controller motions
- Incremental testing and integration for each feature added
- Potentially using some computer vision to classify motions from motion sensor
- Establishing direction of communication between RPi and cloud depending on the circumstance
- Extending functionality to network more than two Comovo devices
- Deciding whether to process sound/motion data locally or on AWS

Schedule


Shrutika
Gauri
All
Week 1-3 4 5 6 7 8 9 (Break) 10 11 12 13 14 15
Date 1/3-1/27 2/3 2/10 2/17 2/24 3/2 3/9 3/16 3/23 3/30 4/6 4/13 4/20
Task
Research
Choose & order hardware parts
Research array localization
Choose cloud platform
Platform
Design
Build
Motor Control
Pi-servo communication
Pi-vgc communication
Map vgc to motion sensor
Pi-Pi over AWS
Send data to EC2
Process data on EC2
Get data from EC2
Test motor control Pi-Pi
Array Localization
Finalize sound stimulus
Rotate motor towards sound
Integration
Manual and automatic switch
Testing whole