AHSANULLAH UNIVERSITY SCIENCE AND TECHNOLOGY
Department of Computer Science and Engineering

Program: Bachelor of Science in Computer Science and Engineering

Course Code: CSE-4264
Course Title: IoT

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Project Title: AI Smart Doorbell

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Submitted by

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Project Title: AI Smart Doorbell

Objective:

To enhance home security and convenience by integrating artificial intelligence into a smart doorbell system, addressing challenges such as visitor identification, false alert reduction, and real-time remote access.

Project Diagram:

Process diagram:
SMART DOORBELL
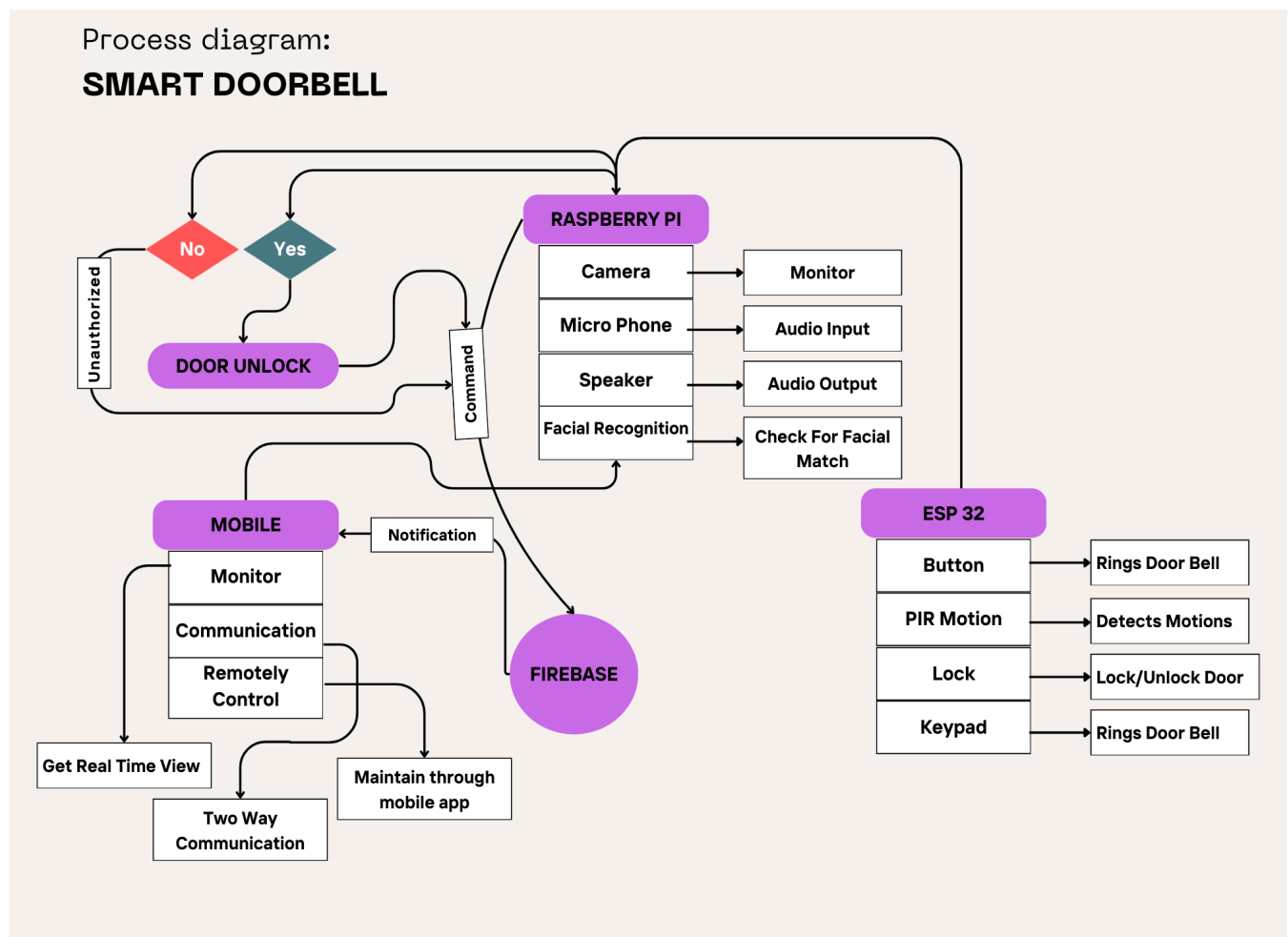
Project Update:

- **Bought necessary hardware and sensors**
- **Connected and tested the camera module**
- **Tried Connecting SPI TFT display to the raspberry pi**
- **Connected PIR motion sensor to the raspberry pi**

IoT Workflow:

1. **Device Enrollment and Authentication:**
   Devices like the Raspberry Pi 4, camera module, and sensors are authenticated and configured for secure operation.
2. **Data Acquisition:**
   - The camera captures images or video for facial recognition.
   - PIR motion sensor detects movement at the doorstep.
3. **Data Communication:**
   - Video and audio data are transmitted to the mobile app using Wi-Fi.
4. **Data Processing:**
   - Facial recognition and motion detection are processed locally on the Raspberry Pi.
5. **Cloud Integration:**
   - Data, logs, and alerts are securely stored in cloud servers for redundancy and analysis.
6. **Data Visualization and Dashboards:**
   - The mobile app presents live video streams, logs, and control options in a user-friendly interface.
7. **Action/Response:**
   - Users can remotely unlock doors, send voice commands, and interact with visitors.

8. **Notification/Alert System:**

○ Real-time alerts are sent to the user's mobile app for any detected motion or recognized visitors.

Building Blocks of IoT Architecture:

a. Sensing Layer:

- **Sensors:**
  - Camera module for video input.
  - PIR motion sensor for detecting movement.
- **Actuators:**
  - Relay module to control the door lock.
- **Embedded Systems:**
  - Raspberry Pi 4 as the central processing unit.

b. Network Layer:

- **Communication Protocols:**
  - MQTT for message queuing.
  - Wi-Fi for data transfer between devices and the cloud.

c. Data-Processing Layer:

- **Edge Computing:**
  - Local processing for facial recognition and motion detection using Python-based AI models.
- **Cloud Computing:**
  - Secure data storage and retrieval for logs and backups.

d. Application Layer:

- **Mobile App:**
  - User-friendly interface for live streaming, two-way communication, and remote control.

- **Voice Command Integration:**
  - AI-enabled voice recognition for added convenience.

Required Equipment:

- Raspberry Pi 4
- Camera Module (HD vision)
- PIR Motion Sensor
- Microphone and Speaker
- Doorbell Push Button (with LED)
- Relay Module
- Power Supply
- MicroSD Card
- Jumper Wires and Connectors