AI & SUSTAINABILITY IN VET EDUCATION

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Title of WP: WP3 – AI-SAVES@ProjectHub

Activity Reference: Domotic system with AI

Logo:

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1. Project Title:

AI-Driven vision recognition for Vocational Education: A Practical Approach

2. Project Category:

IOT, AI

3. Project Description:

This project consists of an intelligent access control system using a Raspberry Pi and a camera that automatically detects the presence of a person. When a person is detected in front of the camera using an AI powered camera system, the system prompts the user to enter a PIN code via a keyboard. The user has 10 seconds to input the correct access code. If the code is valid, access is granted; otherwise, the system triggers an alarm, such as a buzzer or LED light, and sends a message via MQTT indicating unauthorized access.

From a sustainability perspective, this project contributes to both sustainability and security by promoting energy-efficient and intelligent access control solutions. By only activating the system when a person is detected, it reduces unnecessary power consumption and avoids continuous monitoring or manual intervention. Additionally, it enhances home and facility security through an automated verification process, minimizing the risk of unauthorized access.

4. Keywords:

IOT, AI, Vocational Education, Automation, Hands-on Learning

5. Target Audience:

Both educators and Students

6. Project Objectives:

- Develop practical knowledge in IOT and AI.

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- Understand how to design and implement an integrated home automation system.
- Gain hands-on experience in programming microcomputers.
- Understand system-level design: connecting cameras and other devices.
- Improve teamwork, documentation, and presentation skills.
- Explore sustainability through energy-efficient design choices

7. Project Timeline:

Task	Estimated Hours
Raspberry hardware and programming	10 hours
MQTT server setup and communication tests	3 hours
Full system integration and testing	3 hours
Documentation and presentation preparation	4 hours
Total	**20 hours**

8. Resources Provided:

- AI-SAVES Kit
    - Raspberry Pi 5

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- 27W USB Type-C Power Supply for Raspberry Pi 5
- Raspberry Pi Camera Board V2 8MP 1080p (IM8)
- Official FPC camera cable for Raspberry Pi 5 200mm
- Breadboard, LED and resistors

- Python programming guides
- Project report template (DOCX)

9. Tools and Technologies Used:

- Raspberry PI 4
- Hardware: vision camera,led, keyboard, buzzer (optional)
- Software: MQTT broker (Mosquitto) and client (Mqtt Dashboard)
- Python programming language
- AI powered image recognition
- GitHub for version control and project collaboration
- Fritzing for circuit design and testing

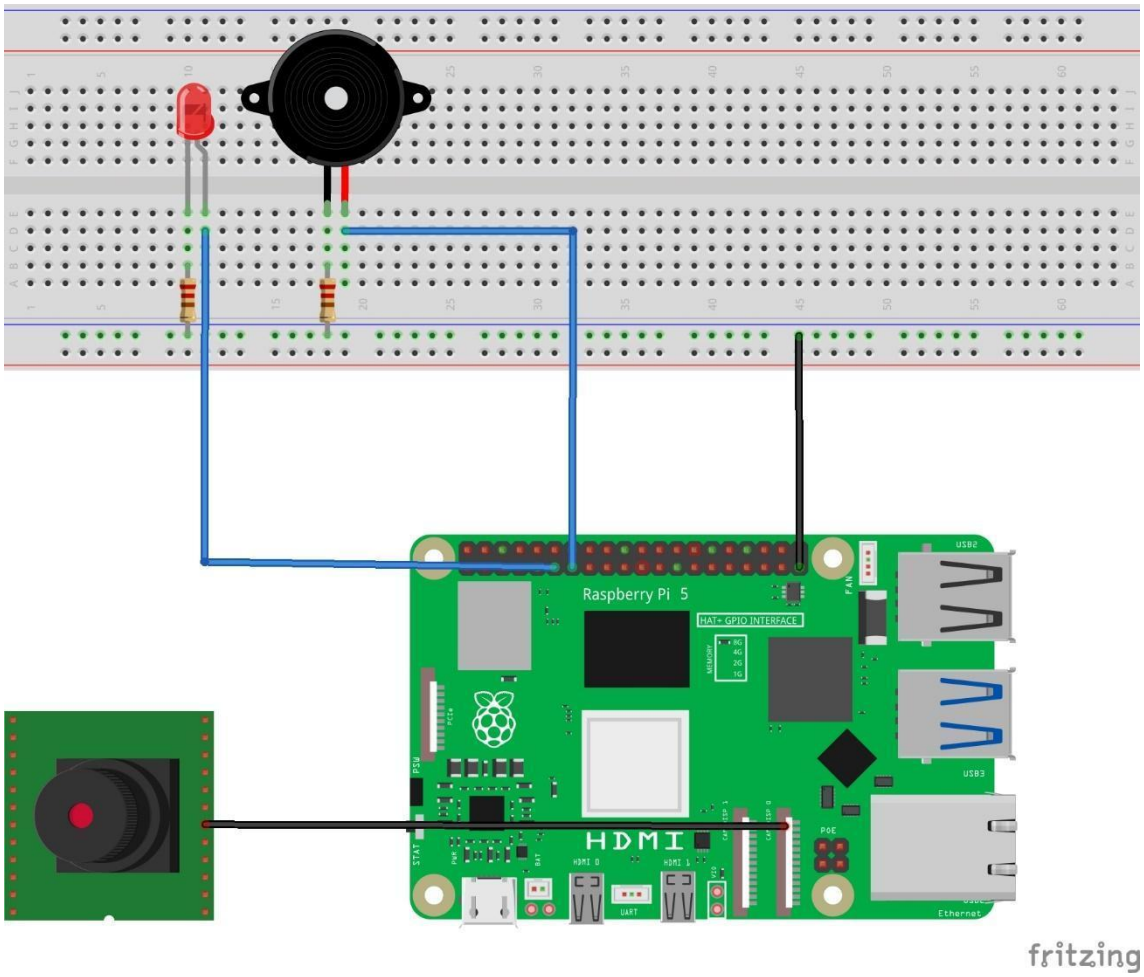
10. Step-by-Step Implementation Plan:

1. Set up the Raspberry Pi with the necessary software (Raspbian OS, Python).
2. Introduce basic concepts of AI powered image recognition (AI models)
3. Conduct practical sessions where students build and program the AI driven access control system.

    a. Assemble circuit according to the GPIO mapping.

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b. Activate Python virtual environment:

cd project_folder_path

python -m venv .venv

source .venv/bin/activate

c. Install required libraries inside your python enviroment:

pip install opencv-python picamera2 ultralitics ncnn paho-mqtt lgpio

d. Install the MQTT broker (mosquitto) in the Raspberri PI

sudo apt install mosquitto mosquitto-client

e. Install the MQTT client (MQTT Dashboard app) in a mobile phone

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f. Create and run the script using Geany or the command line and inside the Python environment

python camera-alarm.py

g. Use the different inputs/outputs to check the system is running properly

4. Evaluate student understanding through project demonstrations.

11. Evaluation Criteria:

- **Hardware Implementation (15%):** Properly connected circuit, no loose wires, correct sensor placement.
- **Code Functionality (40%):** Script runs without errors, correctly detects persons, including MQTT funcionality.
- **MQTT communication system (20%):** communication system is configured properly.
- **Understanding & Explanation (15%):** Ability to explain how the system works and its real-world applications.
- **Creativity & Optimization (10%):** Suggestions for improvements, such as adding additional automation features.

12. Languages Available:

English

13. Contributors:

- Miren Arrien **(Project Lead) -** Lead educator responsible for project development and coordination.
- **Aitor Rey (Technical Expert)** – Provided expertise in AI and IOT.
- **Jokin Goioaga (Technical Expert)** – Provided expertise in AI and IOT.

14. Feedback and Continuous Improvement:

- **Surveys**: At the end of each milestone, students and educators will complete feedback surveys to assess the effectiveness of the project.

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- **Project Reviews**: After project completion, a final review meeting will be held to discuss potential improvements for future AI-based projects.
- **Data Analysis**: Feedback data will be analyzed to identify strengths and areas for improvement, informing future projects.

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