AI & SUSTAINABILITY IN VET EDUCATION

Name of the Author/s: SETUG Mihajlo Pupin N.Macedonia

Title of WP: WP3 – AI-SAVES@ProjectHub

Activity Reference: 3.2 – Project template for AI-SAVES@ProjectHub

Logo:

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AI-SAVES@PROJECTHUB PROJECT SUBMISSION TEMPLATE

1. Project Title:

"AI - Dog chaser"

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2. Project Category:

"AI Tools and Resources"

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3. Project Description:

“This project aims to develop an intelligent surveillance system using Raspberry Pi and object detection technology to monitor restricted outdoor areas and prevent stray dogs from entering. The system operates by continuously rotating a camera to scan the environment. When a dog is detected, the camera halts its movement, a high-frequency sound is emitted to deter the animal, and an LED light is activated as a visual alert. These deterrents remain active until the dog is no longer detected, after which the system resumes its scanning routine. The goal is to provide a cost-effective, automated, and humane solution for maintaining animal-free zones in public or private spaces.”

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4. Keywords:

Raspberry Pi, Object Detection, Rotating Camera, Real-time Alert System, Smart Monitoring

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5. Target Audience:

Both Educators and Students

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6. Project Objectives:

- Develop practical skills in using Raspberry Pi for real-time automation.
- Implement object detection techniques to recognize and track animals.

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- Create a responsive system that combines mechanical motion and audio-visual alerts.
- Understand the integration of hardware (camera, motors, sensors) and software (Python, object detection models).
- Explore the use of AI in monitoring and deterrent systems.

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7. Project Timeline:

- Start Date: April 20, 2024
- End Date: June 5, 2024

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8. Resources Provided:

- Demo video showcasing the building process and a simulation of the AI - Dog chaser functionality
- Assembly manual with step-by-step guidance
- Python codebase for camera input, object detection, LED diode, and buzzer control
- Basic wiring diagram and circuit schematics

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9. Tools and Technologies Used:

- Raspberry Pi 5
- Raspberry Pi Camera Module 4
- Python programming language
- OpenCV for camera input and image processing
- Pre-trained Object Detection Model
- LED diode and buzzer
- Servo motor
- Wood planks for the physical frame

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10. Step-by-Step Implementation Plan:

1. **Hardware Preparation:** Assemble the components — connect the camera module, LED, buzzer, and servo motor to the Raspberry Pi.
2. **Software Setup:** Install the necessary software on Raspberry Pi, including Raspbian OS, Python, and required libraries (OpenCV, TensorFlow or similar).
3. **Camera Control & Rotation Logic:** Program the servo motor to continuously rotate the camera, scanning the environment in a defined range.
4. **Object Detection Integration:** Use a pre-trained object detection model to analyze the camera feed in real time and detect the presence of dogs.
5. **Trigger Mechanism:** When a dog is detected, stop the camera rotation, activate the buzzer (high-frequency sound), and turn on the LED light.
6. **Reset Condition:** Once the dog is no longer detected, resume the scanning rotation and return the system to its monitoring state.
7. **Testing and Calibration:** Run multiple tests to adjust camera angle, detection sensitivity, and buzzer sound level for optimal performance.
8. **Final Deployment:** Mount the system in the desired location for continuous operation and monitoring.

11. Evaluation Criteria:

- **System Functionality:** Evaluate whether the camera rotates properly, detects dogs accurately, and triggers the alert mechanisms (buzzer and LED) as intended.
- **Detection Accuracy:** Measure how reliably the object detection model identifies dogs and how often false positives or missed detections occur.
- **Responsiveness:** Assess the system's reaction time from detection to alert activation and its ability to resume scanning when no object is present.
- **Reliability Over Time:** Observe long-term performance to ensure the system runs consistently without errors or crashes.

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- **User Feedback:** If tested in a real environment, collect qualitative feedback from users about effectiveness and possible improvements.

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12. Languages Available:

Macedonian, English, and if necessary, any other language with the help of translators.

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13. Contributors:

- **Filip Spirov** – Handled the integration of hardware components and the assembly of the wooden frame.
- **Mario Dodevski** – Played an equally important role in connecting the hardware and constructing the wooden parts.
- **Nikola Pecevski** – Developed and optimized the software components of the project.
- **Serdar Cvetkov** – Worked on software programming and object detection implementation.
- **David Menevski** – Led the project design, ideation, and documentation.
- **Professor Angelka Andreski** – Provided guidance and support throughout the project development.
- **AI & Sustainability in VET Education Competition** – Provided hardware components essential for the project.
- **SETUGS Mihajlo Pupin School** – Supplied materials and tools needed for building and assembly.

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17. Feedback and Continuous Improvement:

- **Post-Implementation Survey:** After deploying the project, feedback will be collected through surveys targeting participants involved in the testing and observation process.
- **Team Reflection Sessions:** The project team will organize internal review sessions to discuss challenges faced, what worked well, and areas that need refinement.

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- **Technical Evaluation:** Observations regarding detection accuracy, system stability, and hardware durability will be documented for improving future versions.
- **Iterative Updates:** Based on feedback and performance, updates to the software code and system design will be implemented to improve reliability and effectiveness.

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