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- **Problem Statement ID – SIH1536**
- **Problem Statement Title-** Student Innovation
- **Theme-** Agriculture, FoodTech & Rural Development.
- **PS Category- Software/Hardware -** Hardware
- **Team ID- T16**
- **Team Name –** WeedWipe AI

WeedWipe AI

AI-Driven Autonomous Weed Detection and Precision Pesticide Spraying with Integrated Farm Management System

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❖ **Proposed Solution:**

- AI-Driven Autonomous Pesticide Spraying Bot for precision agriculture.
- Uses computer vision for efficient weed targeting and elimination.
- Includes a Weed Management feature analyzing weed types and quantities for improved crop management.

❖ **Problem Addressed:**

- Traditional weed control methods result in excessive pesticide use and are labor-intensive.
- Lack of precise targeting leads to inefficiencies.
- AI-driven bot reduces chemical usage, minimizes labor, and offers real-time data for sustainable weed management.

❖ **Innovation and Uniqueness:**

- Combines AI-driven weed detection and Crop Disease Identification with an autonomous bot for precision spraying.
- Integrated Weed Management System provides real-time analysis of weed types and quantities.
- Ensures sustainable farming, reduces costs, and enhances productivity with minimal human intervention.

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TECHNICAL APPROACH

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Programming Languages:

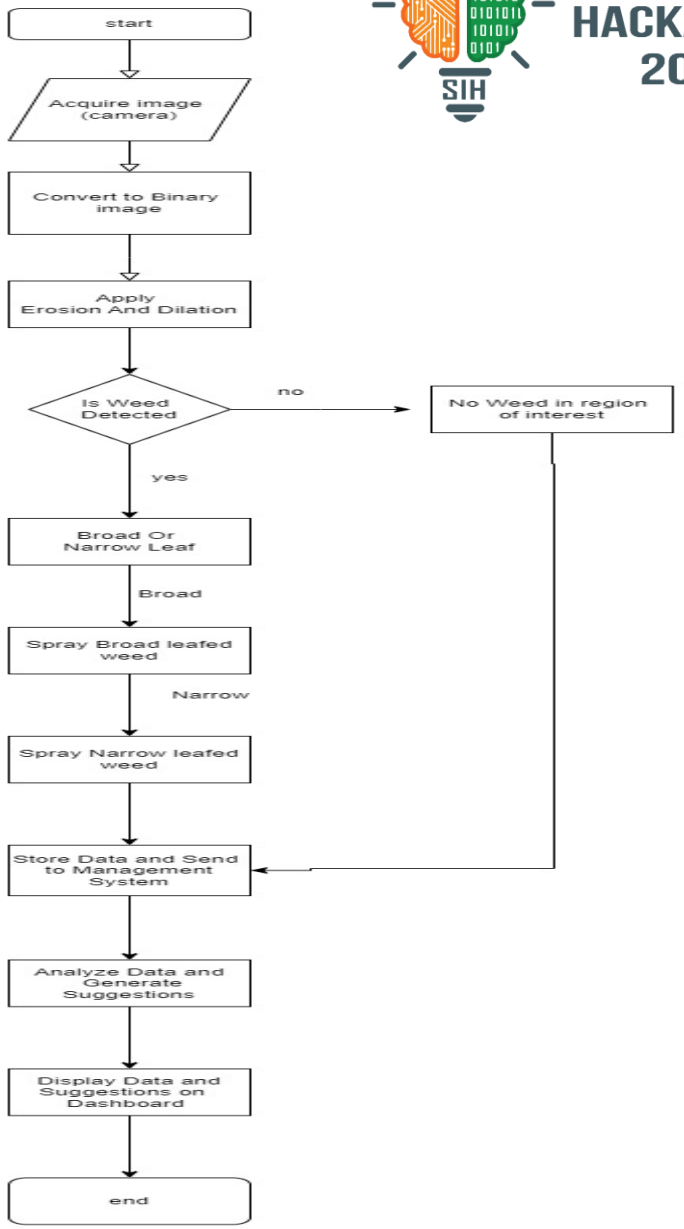
- **Python and micro python:** Data analytics, machine learning, and IoT applications.
- **JavaScript:** Essential for web development and front-end user interface.
- **C/C++:** For embedded systems and performance-critical tasks.
- **Robotics OS:** ROS2.0 Dashing Diademata

Frameworks and Libraries:

- **TensorFlow and PyTorch:** Deep learning frameworks for image processing and object detection.
- **OpenCV:** Computer vision library for image processing and analysis.
- **Keras:** High-level API for building and training neural networks.
- **Flask:** Python web frameworks for developing web applications.

Hardware:

- **Raspberry Pi**
- **Cameras**.
- **Sensors**.
- **Motors**.
- **Actuators**.
- **Microcontrollers**.



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FEASIBILITY AND VIABILITY

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FEASIBILITY

Technological Feasibility: The necessary technologies for computer vision, robotics, and machine learning are readily available and mature.

Economic Feasibility: While initial investments may be required, the long-term cost savings from reduced pesticide use, labor, and crop losses can make it economically viable.

Environmental Feasibility: The bot can significantly reduce pesticide usage, minimizing environmental impact.

Regulatory Feasibility: Compliance with agricultural regulations and safety standards should be considered.

VIABILITY

Market Demand: There is a growing demand for sustainable and efficient agricultural practices, making the bot a potential solution for farmers.

Scalability: The technology can be scaled to accommodate various farm sizes and crop types.

Sustainability: The bot aligns with the trend towards sustainable agriculture and can contribute to long-term environmental benefits.

Competitive Advantage: The bot can provide a competitive advantage for farmers by improving efficiency and reducing costs.

IMPACT AND BENEFITS

❖ Impact:

- **Farmers:** Increased efficiency, reduced labor and chemical costs, improved crop yields.
- **Environment:** Lower chemical usage, reduced soil and water pollution.
- **Agricultural Businesses:** Enhanced productivity, competitive advantage.
- **Consumers:** Safer, environmentally friendly produce.

❖ Benefits:

- **Precision:** Accurate weed detection and optimized pesticide application.
- **Cost Savings:** Reduced labor and chemical costs.
- **Environmental:** Sustainable farming practices, less pollution.
- **Data Integration:** Real-time insights for better farm management and predictive analysis.

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RESEARCH AND REFERENCES

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❖ REFERENCES:

- National Institutes of Health: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7908628/
- Nindamani-Nvidia robot: https://github.com/AutoRoboCulture/Nindamani-the-weed-removal-robot
- Farmer-Management-System: https://github.com/Tejas-Gosavi/Farmer-Management-System.git

❖ RESEARCH:

- ***Design and Development of Automatic Weed Detection and Smart Herbicide Sprayer Robot***
  (By Aravind R, Daman M , Kariyappa B S Professor)
- ***Machine Vision based Agricultural Weed Detection and Smart Herbicide Spraying***
  (By S. Mohan Raj* and V. Kavitha)
- ***Automatic Weed Detection Robot***
  (By Ramaiah Institute of Technology (Autonomous Institute, Affiliated to VTU) Bengaluru – 560054)