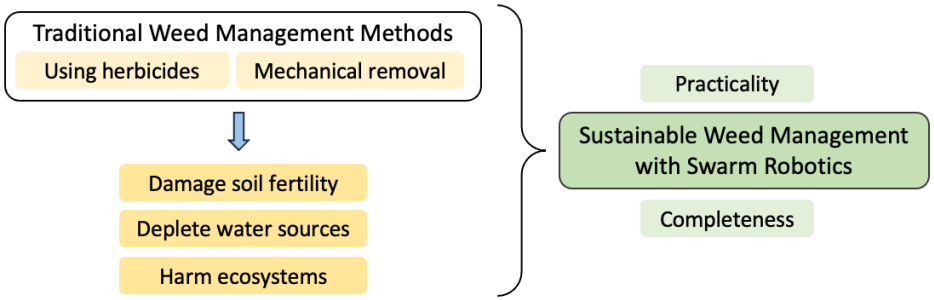
# Swarm Robotics for Sustainable Weed Management: Integrating Algorithms and Design

Zixin Yu, Shanghai World Foreign Language Academy, Shanghai, China

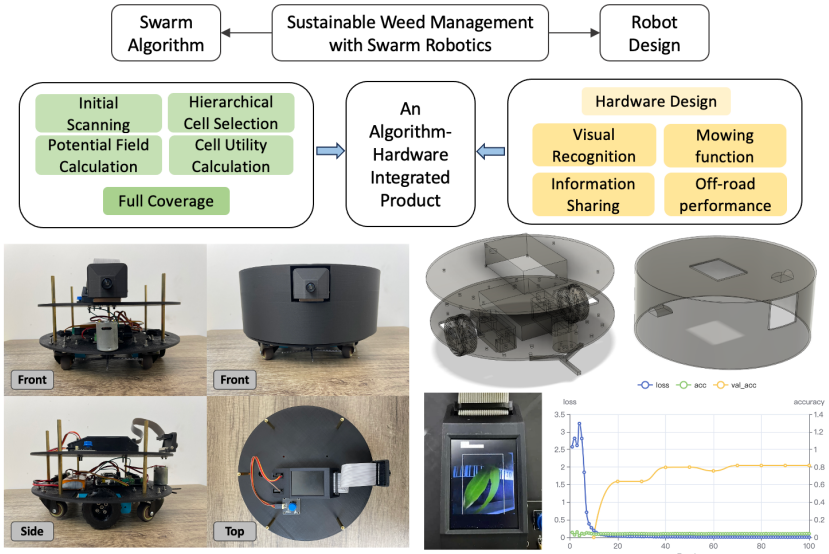
Project ID

## Q1: Research Question

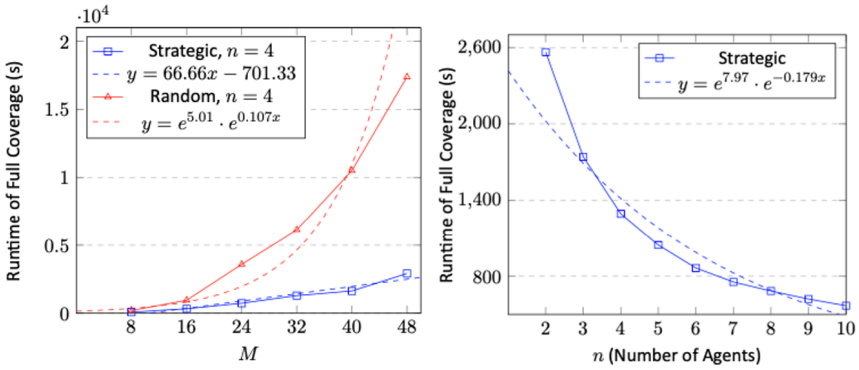



- Traditional weed management methods practices harm the ecosystem and are therefore unsustainable.
- → How to develop a solution that promotes sustainable weed management?
- **Swarm robotics, integrating algorithmic and physical design**

## Q2: Methodology




## Q3: Data Analysis & Results




**1.** 'Strategic' runtime increases linearly while runtime for random walks grows exponentially with respect to increasing field size.
**2.** The efficiency of 'Strategic' improves with more agents at work, but at a gradually decreasing rate.

## Q4: Interpretation & Conclusions

- Strategic weeding method outperforms random approaches, showing increasing as field size increases.
- Development of a robot with visual training supports practical application of the swarm algorithm in agricultural scenarios.
- Sensitivity analyses on the proposed model shed light on optimizing parameters for minimizing field coverage runtime as well as enhancing sustainability.
- Future work will focus on optimization and broader testing, aiming for agricultural application especially in organic farming contexts.