Multi-Agent System for Effective Pesticide Management (ESC205A)

Contributors:-

1. Abhishek Agarwal - 2016126
2. Ankur Rastogi - 2016131
3. Ankur Sharma - 2016225
4. Arnav Kumar - 2016228
5. Ishaan Bassi - 2016238
6. Kaustav Vats - 2016048
7. Lakshya Bansal - 2016240
8. Raghavv Goel - 2016179
9. Sharan Pai - 2016266
10. Deepak Singh - 2016032

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Problem Statement

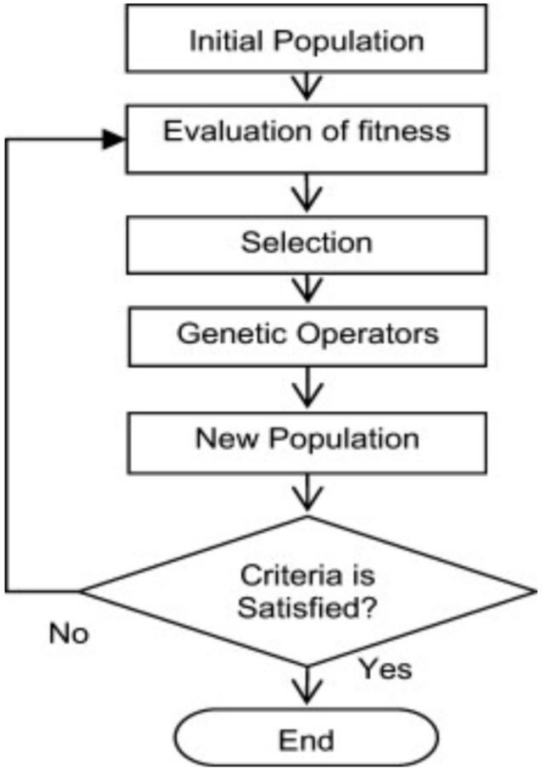
- Pesticides are a **two edged sword** : too much or too less will impact the plant growth
- Use of excess of pesticides causes **water and land pollution**
- Harmful effects on people in spraying fields due to direct contact
- People are unaware of **amount of pesticide** to be used

Proposed solution

- Use drones for spraying pesticides
- Amount of pesticide to be sprayed is optimised using AI
- Path by each drone is optimised to minimize the fuel consumption
- Drones return to starting point for refueling

Genetic Algorithm

- Genetic Algorithm to find optimal path with given constraints
- Gene - Tuple denoting Agent and Fields to cover
- Chromosome - Set of Genes
- Fitness Function - Calculate cost of visiting each field. Cost is denoted by weighted summation of various factors(Fuel, Distance between Fields, etc)
- Stopping Condition - When no new changes observed or enough iterations completed(500)



Simulation and Experiments

https://drive.google.com/file/d/1h9c7Yi0bmvhBCi3oW2AIFk5yGfHKFWEf/view?usp=sharing

Conclusion

- Using AI algorithms in agriculture is very beneficial for the environment
- Framers are less prone to diseases
- Water, pesticides and other precious resources are not wasted
- Ensures the maximum yield of each and every crop

Future Plans

- Irrigation Consumes 70% of world's total water withdrawal
- 60% of water diverted to farms is wasted
- "With the current water management Practice, by 2050 the global agricultural sector will need to double the amount of water used to feed the world"
- **Solution** - Use of Drip Irrigation and Machine Learning

Genetic Algorithm Code

(Link to Github Repository)

https://github.com/kaustavvats/Effective-Pesticide-Management

References

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Thank You

Any Questions?

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