

# Semi-Autonomous Robot using Neural Networking



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# Objective

1. Developing a Semi-autonomous robot that can overcome known obstacles on its own
2. Transferring control back to the user if unknown obstacle is encountered
3. Developing a Neural Network capable of differentiating between obstacles it knows and does not know



# Why?

1. This will help in eliminating the process of micro-managing the robot while still keeping major control with the user
2. It will also increase the speed of navigation as it is not communicating with the user at all times, but only when it is essential
3. With classification of objects, the interaction can be improved

# Motivation & Related Work

Semi-Autonomous Tractor [1]

Obstacle Avoidance Robots [2]

Knightscope, Semi-Autonomous Robot [3]

Mars Rover Mission [4]



# Novelty

- Teaching the robot, what it does not know
- Existing obstacle avoidance robots have same method of interaction for all objects that are in its path
- We want to make an intelligence system which differentiates between known and unknown obstacles with the use of neural networks and pings the user when a novel obstacle is encountered

# Process flow chart

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- Move on a predefined path

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- Detect obstacle in its path

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- Classification of obstacle

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- Avoidance or passing of control based on classification

# Technical Approach

- **Path following:** Existing technologies like Line following or Gps will be implemented.
- **Obstacle detection:** Proximity sensors will be used to detect objects.
- **Data Retrieval:** Once an obstacle is detected camera will be used to get data about the obstacle.
- **Classification Algorithms** Different classification algorithms will be tested out to find the one most suitable for our purpose
- **Training:** Finding the required amount of layers, as number of layers depend upon the amount of features to be extracted.

# Duration

Week	Work
1	Comparing Existing Classification Algorithms and making mechanical structure
2	Completion of mechanical structure and electrical sensor mounting.
3	Development of neural network for our specific purpose
4	
5	
6	Training of neural network
7	
8	Trial runs in an unknown environment



# Budget Required

S.no	COMPONENTS	ESTIMATED COST(INR)
1	Raspberry-pi-3	4000
2	Camera	1500
3	Proximity sensors	1000
4	Motor	2000
5	Manufacturing	2000
6	Miscellaneous	3000
	<b>Total</b>	13500

# References

- [1] *A System for Semi-Autonomous Tractor Operations*, A. Stentz, C. Dima, C. Wellington, H. Herman, D. Stager. Carnegie Mellon University
- [2] *Obstacle-responsive navigation scheme of a wheeled mobile robot based on look-ahead control*, Yu Yu Lwin Yoshio Yamamoto
- [3] Arne Stoschek, William Suntana Li, Philip Wong, "Knightscope Inc", *USPTO Applicaton #: 20150205298 subsection [0054,0055]*
- [4] "Exploring Mars Using Intelligent Robots." *Exploring Mars Using Intelligent Robots. Subsection 2.3.3* <[http://www.doc.ic.ac.uk/~nd/surprise\\_95/journal/vol4/pma/report.html](http://www.doc.ic.ac.uk/~nd/surprise_95/journal/vol4/pma/report.html)>.

**Thank You ...**