GSLAM - Generic Simultaneous Localisation and Mapping Robot
Prof. Prashant Kanade¹, Yash Kalwani², Neeraj Keswani³, Chetan Nihalani⁴, Tejbhushan Kasibhotla⁵
Department of Computer Engineering
VESIT, India

Abstract:
In the era of intelligent machines, it’s always been a challenging task for a machine to remember where it has been i.e. to bind it to its memory that I have visited this place. In human brain a natural device (organ) known as HIPPOCAMPUS does the thing, which we called as SLAM i.e. simultaneous location as well as mapping it to a human mind. Hippocampus is responsible for every memory binding of place human visits. Thus, applying the same concept to a real-world machine, we tend to create an artificial hippocampus for a machine which will help it to remember the places it visits and to map them to its memory for various purposes.

Keywords: Collision, Avoidance, Hippocampus, RatSlam, SLAM.

I. INTRODUCTION

Hippocampus is a part to brain which is responsible for storing and binding places we (humans) see to our memory, i.e. if we hear say “Mumbai”, and if we have ever seen anything about Mumbai our brain projects images in our mind which helps us distinguish Mumbai from other area around the world. Also when we hear anything about our day to days places i.e. “Office”, “College” etc. our brain helps us distinguish this places from all other places in our memory. Similarly same applied to a machine (Robot) will help it to remember place and hence will help it to perform desired tasks at that location. Example: A robot can be used in place of ward boys in a hospital to take care of wards since the robot has a map of hospital a Doctor just has to command it to desired tasks at desired ward. Our idea is to create a Generic Robot based on the idea of Hippocampus. Using concept of Simultaneous Location and Mapping (SLAM), the bot will map the locations and the surroundings in its memory without any GPS or navigational reference. This will help to map the locality and perform any tasks in that locality.

II. LITERATURE REVIEW

1. RatSLAM: A Hippocampal Model for Simultaneous Localization and Mapping M. J. Milford, G. F. Wyeth, D. Frasser School of Information Technology & Electrical Engineering University of Queensland Brisbane, Australia (milford,wyeth, pmser) @itee.uq.edu.au In the above paper, M. J. Milford, G. F. Wyeth, D. Frasser state that in order to navigate a robot must learn from its past interactions and in order to learn from its past a robot should be able to remember certain peak things about the location it visits. They explain a in brief about the architecture of cells that were used on a pioneer robot which they used to implement RatSLAM.

III. G-SLAM ARCHITECTURE

The device clicks images using camera and creates a local view which is stored in its memory every time a new place is visited, new local view is created. When the device encounters a previously visited place i.e. it checks before creating a new local view that is there any local view that exists for this place, if yes, this image is used to modify (smoothen) the previous local view for optimization. As the device performs in real world the device is able to access 3-axis display i.e. with a local view created distance from the device is also measured and stored with the local view. This is accomplished by use of proximity sensors which helps the device to obtain distance in order to map the surroundings more efficiently. As compared to the RatSlam device the use of cells like pose, grid etc. here is done with the help of these sensors. Path Recognition is done with the help of proximity sensors when the device displaces from another these sensors keeps track of the current position of device with respect to its surroundings. With help of these sensors and panoramic camera the device is able to get a logical 3d view of its surrounding and hence its maps them more efficiently.

IV. IMPLEMENTATIONS

Using a 360°/180° panoramic camera with proximity sensors the input of this is given to the device which has a inbuilt processor, which processes the data and creates different logical views. The logical views are stored in the memory and are checked every time when a new logical view is created, for redundancy. With sensors, an odometer is used to get more precise value of distance between two points, odometer clamp is used to dock the device onto other vehicles, which leads to generic nature of the device. Shortest path algorithm is used for optimal path selection after the device has successfully mapped all the possible paths present. Collision avoidance is checked via proximity sensors if the sensors encounters a blockage it tries other way round the blockage and if the blockage is avoidable the device adds the path into mapping else would add a dead end in the mapping.

Figure.1. (a) Virtual mapping
The fig.(a) shows simulation of robot in a room with two objects and boundaries which it mapped and created a 2D image for the same. Observing above data the device was able to move along the boundaries and was able to overcome the obstacles.

V. CONCLUSION

The Rat Slam project was implemented on a Pioneer 2-DXE which was limited to only that robot and hence we are trying to come out with a solution of making it more general and which can be used on any vehicle or machine.

- G-SLAM powered robots can be used for many tasks such as a garbage picker truck where the truck is autonomously picking up the garbage irrespective of the GPS or Internet.

- This can be further extended as the data can be synchronized between many such G-SLAM robots and the data generated can be used more effectively and efficiently.

- This device would act as a generic device which will be compatible with other mobile devices in order to help them to remember the places they visit and to memorize them for desired tasks.

VI. REFERENCES

[1]. David Ball, Scott Heath, Janet Wiles, Gordon Wyeth, Peter Corke, Michael Milford; Open Rat SLAM: an open source brain based SLAM system, Autonomous Robots.