Curriculum Vitae

CONTACT INFORMATION

Jyotika Bahuguna
Robotics Research Lab
International Institute of Information Technology - Hyderabad
Hyderabad
India
E-mail: mailto:jyotika@research.iiit.ac.in

Voice: (+919542966259)

Pin Code: 500032
Webpage:Jyotika

EDUCATION

Internship (May 2009 - Nov 2009)
CNRS LAAS, Laboratoire d'Analyse et d'Architecture des Systmes - Toulouse, France.

- Research: A neural network based model for gaze tracking.
- Area of Study: Human Robot Interaction
- Advisor: Dr. Rachid Alami
  http://homepages.laas.fr/rachid/

MS by research (Jul 2006 - Present)
International Institute of Information Technology,- Hyderabad, India.

(**CGPA: 9.29/10**)

- Thesis Topic: Markovian Decision Processes based active localization for multiple robots by co-operation.
- Advisor:
  Dr. K Madhava Krishna : http://mail.iiit.ac.in/ mkrishna/
  Dr. B Ravindran : http://www.cse.iitm.ac.in/ ravi/

- Area of Study: Mobile Robotics
- Related Courses: Mobile Robotics, Multi-robotics, Pattern Recognition, Artificial Neural networks, Machine Learning.

Bachelors Of Engineering (CS) (Nov 2000- May 2004)
DDU- Nadiad, India.

(**CGPA: 9.0/10)**

TEST SCORES

GRE - General (1390 / 1600)

TOEFL -IBT (104/120)

RESEARCH

I have worked in the areas of Mobile Robotics, Multi-Agent Systems , Machine Learning and Human-Robot Interaction. My thesis deals with designing a method to show how Markovian Decision Process (MDP) can be used to actively localize multiple robots by co-operation. The framework uses MDP's to learn relative temporal information and uses a CMAC (Cerebellar Model Articulation Controller) for function approximation of the activation function.
I worked as an intern at CNRS LAAS, (Laboratoire d'Analyse et d'Architecture des Systmes), on a HRI related project and designed a model to implement gaze tracking.

The model uses recurrent neural networks and a probabilistic framework to filter out jerky head movements.

Publications

- Jyotika Bahuguna, B. Ravindran and K Madhava Krishna, "MDP based Active Localization for multiple robots", (CASE) Conference on Automation Science and Engineering, 2009.

Projects

- MDP based active localization for multiple robots by co-operation:
  This project aims at designing a learning algorithm for multiple robots for actively localizing themselves in a co-operative fashion .The localization of a robot is facilitated if it detects other robots or moves towards unique landmarks in the map. The MDP formulates a method to calculate the value of belief states, such that the robot learns to move towards the frontier that enables it to either detect other robots or detect unique landmarks in the map. The belief space being infinite in nature, requires a function estimator to calculate the goodness of every belief state without listing the whole state space. The tile coding implementation is used to achieve the same.

- Stereo Based localization:
  The aim of the project is to localize a robot with respect to global landmarks using stereo correspondence. The method requires to estimate the depth to various landmarks and then the triangulation method is used to find out the robots position in the map. The depth estimation requires stereo rig calibration and rectification of the image thereby reducing the problem to a 1D search problem along the horizontal raster lines of the rectified images.

- Neural Network based gaze tracking model:
  For certain HRI applications, it is important to know where the human is looking to enable the robot counterpart to interact with human accordingly. There are various methods used for gaze tracking. The model is being implemented for a motion capture setup. The head position being given by the motion capture system, the model tries to estimate the gaze position. A recurrent neural network is used to map the nonlinear relation between the head and the gaze position. A user study has been done to capture the most natural gaze position for a head position. The output of this model is captured temporally into a probabilistic framework to filter out sharp head movements. This module would be used in implementing shared attention between a human and a robot.

- Support Vector Path Planning:
  This is a simulated implementation done as a course project, based on the above paper by Miura, J. It employs SVM s(Support Vector Machines) to obtain a collision-free path connecting a start and a goal point in highly cluttered environment. This requires to first divide the whole space into two regions and then picking up the boundary as the path. SVM generates a non-linear separating path based on the margin maximization problem. This property is suitable for usual path planning problems, since it generates a smooth and safe path. I also used kernel boosting to tune the implementation for more complex paths.

- Reinforcement learning in multi-robotic domain.:
  This is a simulated implementation done as a part of course, based on the above paper by Maja Mataric. The methodology involves minimizing the learning space through the use of behaviors and conditions, and dealing with the credit assignment problem through shaped reinforcement in the form of heterogeneous reinforcement functions and progress estimators. The approach was tested on a simulated environment of a group of mobile robots learning a foraging task.

- SLAM:
  The aim of the project is to localize a mobile robot and build the map of the environment simultaneously. The robot employs a set of sonar sensors to obtain readings of the surroundings. The scan matching algorithm is used, which involves alignment of successive scans of a robot to correct the odometry errors in the robots pose.

Working Experience

- Worked as an embedded engineer in eInfochips Pvt Ltd (http://www.einfochips.com/)

Presentation and Seminars

- Showcased projects at the annual R&D showcase, IIIT Hyderabad in the years2007 and 2008.
- Organized the Robo-safari in IRoCha competition that coincided with IJCAI 2007 at Robotics Research Center at IIITH. It required the robot to visually recognize the objects in its environment, and to localize its position.

Programming experience

- C , C++, Java
- Perl, Shell scripting
- Linux, MS-Windows
- Tools: Matlab, opencv, fann, svmlight, Aria, Qt, MobileSim, latex
- Robots: Amigobot, Pioneer P3DX.

Research Interests

Machine Learning, Neuroscience, Biological systems modelling, Robotics, Multi-agent systems.