

# JANANI MOHAN

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## OBJECTIVE:

Full-time Opportunities in the field of Robotics and Automation with focus on Vision and Navigation.

## EDUCATION:

**Worcester Polytechnic Institute (WPI)**, Worcester, MA  
**Master of Science in Robotics Engineering**, GPA 4.0/4.0 May 2018

**College of Engineering (CET)**, Trivandrum, India  
**Bachelor of Technology in Applied Electronics and Instrumentation**, GPA: 8.73/10 May 2013

**Relevant Courses:** Computer Vision, Probabilistic Robotics, Robot Dynamics, Digital Image Processing, Robot Control, Motion Planning, Advanced Robot Navigation, Swarm Intelligence

## CERTIFICATIONS:

Introduction to the Internet of Things and Embedded Systems, License No: BJPWZPS3N6AH October 2015

## INDUSTRIAL EXPERIENCE:

**Robotics Software Intern, Vecna Robotics, Cambridge, US** June 2017-Dec 2017  
Developed an algorithm for Image texturing on a 3D Mesh generated from depth images.  
Verified and tested the algorithm on hardware attaching the camera to UR5 arm.

**Embedded Software Engineer, BOSCH, Bangalore, India** Sept 2013-July 2016  
Contributed in low-level driver development in the Powertrain domain of Robert Bosch Engineering and Business Solutions Ltd (RBEI).  
Designed and developed CAN (Controller Area Network) protocol driver for Power-Train ECUs.  
Developed diagnostic software layer, calibration tools for On Board Diagnosis.  
Analysed LIN (Local Interconnect Network) driver layer for immobilizer interface application.

## PROJECTS:

**Thesis: Dynamic Task Allocation in Swarm Robots with Limited Buffer and Energy Constraints** Aug 2017 - Present

*Objective: To study task allocation in a swarm of robots performing data sensing*

The main contribution of this work is the dynamic decision making algorithm for assigning the suitable task (data gathering or data relaying) to the robots based on data buffer and energy constraints of other robots in the swarm.

**Indoor Mapping using 3D SLAM for Assistive Robots:** February 2017 – May 2017

*Objective: Design and develop SLAM algorithm for assistive robot.*

1) Developed an indoor map of a LAB environment to guide an assistive robot for navigation and object localization and tracking.

2) Implemented techniques for map optimization for more accurate loop closure and object localization.

**Model Predictive Controller for Vehicle Formation Control:** February 2017 - May 2017

*Objective: Implement MPC based controller for virtual center based convoy of vehicles.*

1) Developed an MPC - based Controller for convoy-like vehicles.

2) Formulated a control algorithm to effectively model the constraints relating to static and dynamic obstacles while driving in a non-linear vehicle formation/convoy model.

**Optimal Trajectory Motion Planner for Valkyrie:** February 2017 – May 2017

*Objective : Test Motion Planning Algorithms on Humanoid Robots*

1) Designed and implemented various motion planning algorithms such as A\*, ARA\*, RRT, RRT\* for defining the optimal trajectory for Humanoid Robot, Valkyrie.

2) Designed methods on utilizing full body control to increase more stable gait and faster throughput.

**NASA Space Robotics Challenge:**

October 2016 - January 2017

*Objective: Team WHRL- Qualification Task 1*

- 1) Worked on detection and determination of location and RGB value of lights on a Light Panel that lights put at regular intervals in a random pattern.
- 2) Applied Perception techniques such contour extraction, back projection and normalizing images.
- 3) The location was determined from Pointcloud by reprojecting the 2D Pixel coordinates of contour center to 3D points. Used the point cloud data from Multisense to localize the center of each light.
- 4) Developed an algorithm that detects 20 lights in a row within an overall error of 0.139m for 20 lights that helped us to qualify for the finals. Formulated an error correction technique for Multisense Stereo camera using K-Means clustering and KD-Tree algorithms for reducing the error of each light center.

**BGA Chip Assembly using ABB IRB 120 Industrial Robot:**

October 2016 - December 2016

*Objective: Implement Pick and Place of BGA (Ball Grid Array) chips onto PCB with the help of ABB IRB 120 Industrial robot.*

- 1) The location of the BGA chip in the table and its placement location on the PCB was determined using Vision techniques and the entire process was designed using OpenCV-ROS.
- 2) The trajectory planning and inverse and forward kinematics were simulated using the Eigen Library in ROS-Gazebo.
- 3) The simulation of the pick and place task was implemented in Gazebo using ROS.
- 4) A prototype hardware implementation of the entire process was demonstrated on the Real ABB IRB 120 robot using ROS-Industrial and MoveIt Packages.

**Chess Piece Recognition using Vision:**

November 2016 - December 2016

*Objective: Applying Computer Vision techniques to detect and classify White Chess pieces.*

- 1) Demonstrated chess piece detection using Template Matching and Feature Extraction techniques. The features were matched using Brute Force Matcher.
- 2) Classified the different chess pieces into Castle, Knight, Bishop, King, Queen and Pawn using two techniques namely: Contour Area Based and Machine Learning Based. Both techniques were developed and demonstrated for real-time classification.

**RF Based Fire Fighting Robot:**

July 2013

*Objective: A semi-autonomous Fire Fighting Robot for small-scale applications.*

- 1) Designed and developed a wireless remote controlled miniaturised version of fire extinguishing robot.
- 2) Developed the motion planning and image processing algorithms of the firefighting robot.
- 3) Applied sensor fusion techniques to transfer image data to an on-line client computer.

**SKILLS:**

**Programming Languages:** C, C++, Embedded C, Arduino C, CAPL.

**Scripting Languages:** PERL, Python.

**Operating Systems:** Linux, Windows.

**Application and Tools:** ROS, Gazebo, OpenCV, PCL, OGRE, OpenRave, MATLAB, ARGoS, Buzz, PSpice, DipTrace, MAPLE, UDE ECU Workx, Canoe, Arduino IDE, Git, Clear Case, Clear Quest, SDOM.

**Robotic Platforms:** Valkyrie, ABB IRB 120 Industrial Robot, TurtleBot, UR5 ArmBot.

**ACHIEVEMENTS:**

4th Place in the Finals of Space Robotics Challenge hosted by NASA. Team WHRL is one among the top 20 teams who qualified from 92 teams around the world.

February 2017

Received Appreciation Notes from On-site Clients for excellent quality and on-time code delivery of CAN

Driver Software delivered to GM-DENSO Project.

March 2015

Completed Bachelor of Technology in Applied Electronics and Instrumentation with overall third rank and received first class with distinction certificate.

August 2013

Finalist in "INNOVATIONEER" competition as a part of "SHAASTRA-12" conducted in IIT- Madras, where more than 500 members participated.

March 2012