

EKFmonoSLAM for the IntelliTable robot

Harry Jackson
University of Sheffield
hjackson3@sheffield.ac.uk

August 13, 2015

Contents

1	Introduction	2
2	Quick Set-up	2
3	Analysis	2
3.1	Processing speed considerations	2
3.2	Average mahalanobis distance	2
4	Next steps	2
4.1	Transfer to the intelliTable	3
4.2	Possible improvements	3

1 Introduction

The EKFmonoSLAM uses a EKF-SLAM algorithm originally designed by Joan Sola [Sola et al., 2012, Sola et al., 2008].

2 Quick Set-up

This section outlines the steps that need to be taken to set up the SLAM algorithm software in MATLAB. This set-up assumes you have MATLAB already installed.

To run the toolbox using an actual robot, the Robotics System Toolbox is required. The software for running the toolbox is publicly available online¹. The repository contains detailed instructions on set-up.

The software here is designed for use with a Kuka Youbot but the core functionality should work with any robot.

3 Analysis

3.1 Processing speed considerations

The average processing time is roughly 0.2s. This means that the SLAM algorithm is currently working at 5Hz on a Intel 3.5GHz processor. This is not as fast as other visual SLAMs [Davison, 2003], but is fast enough for purpose as the intelliTable will not move at particularly high speeds.

The slower processing speed has some advantages though; as the camera frame needs to be called on every iteration, only calling this 5 times per second means that it is unlikely that there will be lag between calling and receiving the image which might affect the ability of the SLAM.

3.2 Average mahalanobis distance

4 Next steps

At this current stage, the algorithm has been adapted to work with a camera attached to the Youbot, but path planning is still not put in place.

Navigation

The robot can move very simply - in a straight line until possible collision, then rotates clockwise until it would no longer collide - but no other navigation has been implemented yet.

¹<https://github.com/HJackson3/intelliTable-SLAM>

4.1 Transfer to the intelliTable

4.2 Possible improvements

References

- [Davison, 2003] Davison, A. J. (2003). Real-time simultaneous localisation and mapping with a single camera. In *Computer Vision, 2003. Proceedings. Ninth IEEE International Conference on*, pages 1403–1410. IEEE.
- [Sola et al., 2008] Sola, J., Monin, A., Devy, M., and Vidal-Calleja, T. (2008). Fusing monocular information in multicamera slam. *Robotics, IEEE Transactions on*, 24(5):958–968.
- [Sola et al., 2012] Sola, J., Vidal-Calleja, T., Civera, J., and Montiel, J. M. M. (2012). Impact of landmark parametrization on monocular ekf-slam with points and lines. *International journal of computer vision*, 97(3):339–368.