

## Amendments to thesis to address reviewers' comments:

p2:

- Vision sensors provide a lot of information,<sup>1</sup> however building a system for localization

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<sup>1</sup>More accurately vision sensors provide a lot of data. Robustly extraction of even a fraction of the information present in images is a very challenging task for contemporary machines.

p78:

to digital converter are processed in a digital signal processor which sends its time stamped<sup>1</sup>

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<sup>1</sup>The expression “time stamped measurement” refers to a sensor measurement which has been augmented with an estimate of the time (i.e. the time stamp) at which the measurement has been taken – this is the same as that mentioned in section 3.8.1.

p91: “time–stamps” should be replaced with “time stamps” to keep consistency with the rest of the text. Please white out the “–”

p97:

protector.<sup>1</sup> Figure 3.13 shows the laser scans overlaid on the corrected robot path (using the

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<sup>1</sup>The collision introduced an unmodeled orientation error which prevented line measurements of walls passing through the validation gates of corresponding line map features. Thus the orientation error could only be inefficiently reduced through updating point landmarks. Note that the use of a rate gyro would alleviate the problems caused by collisions.

p105: “withing” - “within”

p131:

Table 4.5: Absolute errors in  $x[\text{cm}]$ ,  $y[\text{cm}]$ ,  $\theta[^\circ]$ , number of iterations and runtime [ms] of the PSM algorithm in the experiments with ground truth. Rows correspond to scenes 0–9, and columns correspond to matches 0–5.

p141:

error in position and 2 in orientation.<sup>1</sup> The total number of scan matching trials was 2500

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<sup>1</sup>Note than in the case of unsuccessful matches, the scan matching process either converged to local minima or diverged. In a simplified view one can imagine that the points of a fixed reference scan are connected to the associated points of the current scan with rubber strings. Convergence to a local minimum occurs, when for given associations the net force on the current scan equals zero.

p144:

resulted in a curved corridor.<sup>1</sup>

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<sup>1</sup>Note that SLAM using scan matching could cope better with the orientation error induced by the collision than SLAM using laser and sonar. The likely reason for this is that after the robot returned to the corridor, the error could be corrected more quickly using scan matching than by the re-observation of point landmarks (see pg. 97).

p132:

