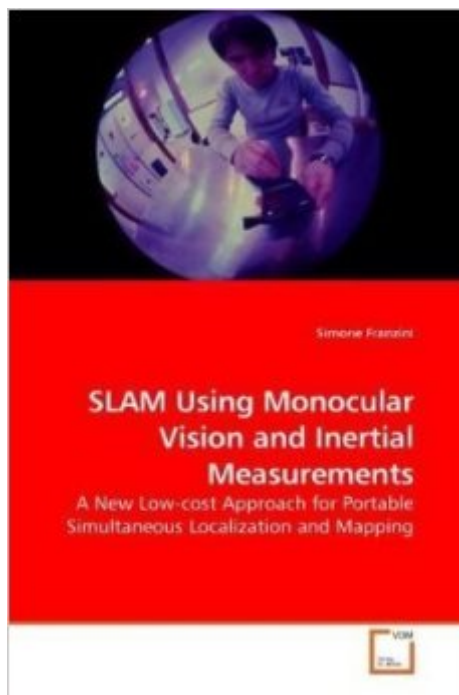


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# SLAM Using Monocular Vision And Inertial Measurements: A New Low-cost Approach For Portable Simultaneous Localization And Mapping



## Synopsis

Simultaneous Localization and Mapping, comprising estimation of robot ego-motion and building a map of the surrounding environment, is one of the most fundamental tasks of mobile robotics. Many SLAM systems proposed in the past make use of the Global Positioning System (GPS), which renders them both expensive and overly dependent on the presence of the GPS signal. We propose an alternative, low-cost approach for portable SLAM which is based on monocular vision, a promising technique due to its flexibility, ease of use, and ease of calibration. In order to perform this task we use an Extended Kalman Filter, one of the most efficient and robust methods used in SLAM systems. We show how it is possible to improve the estimated position and reduce its uncertainty by fusing data from different sensors, in particular using a simple 3-axis accelerometer. We prove, through careful and intelligent selection and tuning of image analysis algorithms, that real-time, low-cost SLAM is feasible. This work is useful to professionals developing SLAM systems and to people in the larger field of computer vision, especially those interested in feature detection and tracking.

## Book Information

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## Customer Reviews

This monograph appears to be a PhD Thesis, but it is not very high quality and it does not deliver on the promise in the title. I suspect that the work is incomplete. The book is full of grammatical and spelling errors, including made-up words like "furtherly". The author is clearly not a native English speaker, so it is not entirely his fault, and I am not criticising him for his language skills. What is annoying is that the publisher did a poor job of editing the manuscript before it was published. The book appears to be a "print on demand" book. It is in black and white. However, the author refers to

features in some of the figures by color: red, cyan, yellow. It is impossible to tell these features apart, and they are even difficult to see at all. However, the worst aspect in my opinion, is that the book fails to deliver on its promise of offering a SLAM solution using sensor fusion of monocular vision and an accelerometer. On page 49 the author states: "These results, which partially disattended (sic) the expectations, are possibly due to issues with the datasets and/or the physical model. Therefore, we decided to concentrate on the monocular vision system and test on it a number of techniques to improve its accuracy and efficiency." To paraphrase this, the author could not get the accelerometer to work, and so he gave up. Figure 6.8 clearly shows that the results are significantly worse when the IMU is used. This in fact disproves the hypothesis that sensor fusion will result in reliable SLAM. Other figures (6.11 through 6.16) show that most attempts to improve the SLAM results failed; in some cases they were significantly worse. What's more, only one dataset is reported which was recorded from a camera moved by hand over a total distance that appears to be less than 4 meters. There are no robots in this work. The author admits that the algorithm could not run in real time because it was written in Matlab. The KLT feature detector implemented by the author is two orders of magnitude slower than it should be (see Table 6.4) but the author does not offer a satisfactory explanation. In the final chapter, the paragraphs under the heading of Contributions are mostly summaries of the previous chapters which do not make a significant contribution to the body of knowledge. Lastly, there is an advertisement at the back of the book for VDM Publishing House. This seems to be a scientific equivalent of the vanity press, which leads me to question the value of their publications.

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