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# Image-based memory for robot navigation using properties of omnidirectional images

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## Abstract

This paper proposes a new technique for vision-based robot navigation. The basic framework is to localise the robot by comparing images taken at its current location with reference images stored in its memory. In this work, the only sensor mounted on the robot is an omnidirectional camera. The Fourier components of the omnidirectional image provide a signature for the views acquired by the robot and can be used to simplify the solution to the robot navigation problem. The proposed system can calculate the robot position with variable accuracy ('hierarchical localisation') saving computational time when the robot does not need a precise localisation (e.g. when it is travelling through a clear space). In addition, the system is able to self-organise its visual memory of the environment. The self-organisation of visual memory is essential to realise a fully autonomous robot that is able to navigate in an unexplored environment. Experimental evidence of the robustness of this system is given in unmodified office environments.

**Author Keywords:** Omnidirectional vision; Image-based navigation; Fourier transform; Hierarchical localisation; Mobile robot

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