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# A Novel Approach for Indoor Localization Using Human Gait Analysis with Gyroscopic Data

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## ABSTRACT

Way finding is one of the main difficulties that vision impaired people face, especially in indoor environments. Although Global Positioning System (GPS) based navigation is possible outdoors, the accuracy of GPS is not sufficient for indoor navigation and way finding. Most of the existing indoor localisation and path finding techniques depend on additional infrastructure deployed in the environment. This paper proposes a novel technique for indoor localisation based on human gait using mobile devices. It involves inertial sensors and other sensors such as magnetometer, generally embedded into the mobile phone. Progress made from data collection indicates that there is a better correlation of gyroscopic data than acceleration data to the gait of the person. Data was collected in different environments with the involvement of multiple male and female volunteers with no vision impairment and disability. The two carrying positions considered in this experiment were in the hip pocket (pocket of the trouser) and clipped into the belt (hip). It was also observed that the gyroscopic data can be used to identify different activities, such as walking on flat land, climbing up and down stairs and walking on inclined planes. Various positioning scenarios determined that a possible optimal location for the data gathering device was in the subject's hip pocket as compared to placement on the belt (hip region) as the movement of the thigh can be tracked when the device is placed in this position. Although the amplitude of the signal is small at the beginning and the end of the travel, the gyroscopic signal clearly identifies the step events. It is concluded that gyroscopic data gives promising results in indoor localisation using gait analysis when the device is placed in the hip pocket.

**KEYWORDS**: indoor positioning, gait analysis, mobile inertial sensors, gyroscopic data