Chapter 3
MagiThings:
Gestural Interaction with Mobile Devices Based on Using Embedded Compass (Magnetic Field) Sensor

Mehran Roshandel
Deutsche Telekom Laboratories, Germany

Amin Haji-Abolhassani
McGill University, Canada

Hamed Ketabdar
Deutsche Telekom Laboratories, Germany

ABSTRACT

This paper proposes a new approach for the “around-device interaction” based on magnetic field interaction. The new approach, called “MagiThings”, takes the advantage of digital compass embedded in the new generation of mobile devices. The user movements of a properly shaped magnet around the device deform the original magnetic field. The magnet is taken or worn around the fingers. The changes made in the magnetic field pattern around the device constitute a new way of interacting with the device. The mobile device samples momentary status of the field. The field changes, caused by hand gesture, are used as a basis for sending interaction commands to the device. The proposed methodology has been successfully tested for a variety of applications such as interaction with the user interface of a mobile device, character (digit) entry, user authentication, gaming and touch-less mobile music synthesis.

INTRODUCTION

Compass, a human made navigational tool, has been widely employed to facilitate the navigation difficulties in the past centuries. An ordinary compass, by itself, is nothing more than a magnetized needle that pivots on an axis and tends to stay aligned with the earth’s north-south magnetic field. Recent developments in electronics, has introduced compact, cheaper and high performing electronic devices, such as magnetometer, gyroscope, and accelerometer.

DOI: 10.4018/978-1-4666-8583-3.ch003
In recent years, digital compass, along with other genre of sensors, such as GPS, accelerometer and dual camera have been embedded within the cell phones to enhance the functionalities of the phone. Digital Compass along with GPS has been used to provide navigation to the user. It is shown that the usability of the digital compass can be extended beyond navigational applications, providing a new user interaction approach with mobile devices (Ketabdar, Yüksel, & Roshandel, 2010b).

The electronic magnetic sensor in a mobile device acts like a regular compass. Any slight displacement of the device with respect to the earth’s magnetic field is sensed and registered by the device. A similar type of influence can be imposed upon the magnetic field of the sensor if a permanent magnet slides around the device. Specifically, a small magnet that moves around the device affects the magnetic field around the sensor, and therefore generates a temporal pattern which changes along the x, y and z axes depending on the movement of the magnet. This pattern can be used to establish a touchless interaction framework as a means of interaction between the user and the device (Figure 1). In other words, the user generates a specific gesture while moving the magnet, which creates a temporal pattern of change in the magnetic field sensed by the compass sensor. This pattern can then be compared against the pre-recorded templates or pre-trained models in order to recognize the gesture and interpret it as a command. This touchless input method addresses some of the limitations commonly associated with traditional input methods, such as keypads or touch screens interaction. One of the main restrictions in designing miniature electronic devices is the size of the user input interface that needs to be large enough to comply with the human physical characteristics. A small properly shaped magnet, e.g., in shape of a rod, ring or pen though, can freely move in the 3D space around the device which is considerably broader than the surface of hand held device screen. A properly shaped magnet is magnetic material that can be taken in hand or worn around a finger comfortably and naturally. By this means, a small handheld device could be augmented with an enhanced user interface mechanism that can overcome the limitation of the device in terms of user interaction. Moreover, the 3D characteristic of the proposed method opens new door

Figure 1. Gestural interaction with a mobile device by a magnet taken (or worn) around a finger, based on using embedded compass sensor

www.igi-global.com/e-resources/library-recommendation/?id=109

Related Content

Secure Group Communications in Wireless Networks
www.igi-global.com/chapter/secure-group-communications-wireless-networks/17183?camid=4v1a

Assessing Human Mobile Computing Performance by Fitts' Law
www.igi-global.com/chapter/assessing-human-mobile-computing-performance/26501?camid=4v1a

Prioritization Schemes in Queuing Handoff and New Calls to Reduce Call Drops in Cellular Systems
www.igi-global.com/article/prioritization-schemes-queuing-handoff-new/55084?camid=4v1a

Modern Standards for VoiceXML in Pervasive Multimodal Applications
www.igi-global.com/chapter/modern-standards-for-voicexml-in-pervasive-multimodal-applications/133748?camid=4v1a