Gyroscope Based Pen-Like Interaction for Text Input in Mobile Phones: A Review

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Abstract— Many different methods have been proposed for providing text input in mobile phones. In this paper, I made a study on GyroPen that uses gyroscope sensor for text input. Users write on a drawing plane using phone's corner and the movement of the phone is measured by gyroscope. It directly uses the angular trajectory for reconstruction of motion path to remove the necessity of accurate absolute 3D position estimate which is difficult using low-cost accelerometers. A handwriting recognition system is used for size and writing-speed normalization. The paper also includes the technique used for text-input beginning with steps like initialization, tracking movement, Post processing and so on.

Keywords: Gyropen; Gyroscope; Trajectory; Accelerometers.

I. INTRODUCTION

Text input is a popular area of interest in mobile phones. The small screen often limits user interaction. Various text input methods have been immersed including button input, soft keyboards used in touchscreen phones, use of stylus for writing on touchscreen. GyroPen a technology introduced in this paper provide a similar experience as writing with a pen. It uses the phone’s corner to write on a drawing plane surface as shown in (fig.1).

II. LITERATURE REVIEW

Many methods have been developed in recent years to take text input [32], one is TiltText in which there are 12-buttons and the text is predicted using the tilt sensor. Another is shrimp which uses the phones camera for text input.

PhonePointPen and Airwriting methods developed allow users to write in air and then detect the words writing. Next WalkType developed were used in touch screen to provide user the facilities to type while they are walking and the misplaced words are predicted and corrected. In 1999 B. Miler proposed handwriting recognition using acceleration – based motion detection where accelerometer sensors are used to detect the motion and the appropriate words are recognized.

Daser was also developed which was a gesture-driven data entry method interface for mobile computing. In this way a number of methods have been developed to take text input for mobile devices. And now GyroPen which takes input using the phone corner to write on the surface and detect the words written.

III. GYROSCOPE BASED APPROACH IN GYROPEN

A technique is developed to take text input in mobile phones in which user write on a surface using phones corner and then the motion is detected using the gyroscope sensors. This technique is developed by Thomas Deselaers, Daniel Keyser, Jan Hosnag, Henry A. Rowley [32].

The idea behind using Gyroscope was the when we write with a pen mostly we don’t exactly move our hand from one place to another we only move our fingers and wrist while writing hand is moved only when we want to have space and write a new line so gyroscope is used to measure rotation.

The figure 2 shows the assumptions made to detect the motion of the writing path [32]. Here w0 and wt are points between which the phones corner move and c is the point where the person touches the phone. C position any change according to the person how he holds the phone.

With gyroscope a commonly built-in sensor available in modern smartphones, is used to detect the movement of the phone while writing on the plane. A handwriting recognition system is then used to recognize the characters and provide effective text input. It has promising capabilities for text entry which eliminates the text entry problem associated with inefficient 12-button predictive technique and fat finger problem in soft-keyboards used in touch screen devices.
Figure 2: Measurement Done To Detect The Motion

The steps to detect the movement and predict the words written are as follows [32].

First is the initialization step in which the initial altitude is set and a number of times gravity is measured using accelerometer to properly set the gravity and initial altitude.

Next is the tracking movements where the initial altitude is updated this update is done by multiplying the initial altitude with the angle it is rotated which include the angular velocity and the time taken for measurement the measurement are obtained using the gyroscope.

Another step is finding the new word, as writing a new word needs space to be given a method is developed which allow the user to write a new word over the one it have written previously no need to move and space words. A 7x5 cm box is provided which is sufficient for writing. The new word is determined by the pen up gesture recognition threshold values are set and based on it the variation in the values above and below the threshold values are used to determine the new word starting.

After the motion movement of pens are recorded some Postprocessing steps are done to get the writing path and also minimize the variations occur in handwriting when writing with the phones corner and that writing with the pen. It includes the detection of start and stop of writing which is done by setting the threshold values and then the slope and slant correction of words are also done to properly detect the words written without ambiguity inspire of different handwriting styles used by different users.

The technique can also be used as a laser-pointer mode to detect paths using the gyroscope readings. This would be helpful if to use phone like a laser.

Next when the reading are obtained processing are done then the handwriting recognizer is used which is an online recognizer. The handing recognizer is used to normalize the writing size and speed so it will not have any effect on recognizing. A handwriting recognizer plays an important role in text input.

At the end calibration is done to find the sensor readings difference and is done for each phone. The raw and calibrated reading are compared to detect the noise effects occur which the sensor readings.

**CONCLUSION**

In this paper, I made a study and review of GyroPen technology introduced recently which prove to be an effective medium of text input in mobile phones. It reconstructs the users writing path using internal sensors of phone and can be recognized easily by off-the-shelf handwriting recognition engine. It can be very useful for people having difficulty in typing and for people knowing there regional language only can easily write like a pen. It has also overcome the problem of pen up stoke and can be used without any modification to the hardware in modern smart phones.

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**References**


