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**A PROJECT REPORT**

**ON**

**“DIGITAL PEN WITH A TRAJECTORY RECOGNITION ALGORITHM FOR  
HANDWRITTEN DIGIT AND GESTURE RECOGNITION”**

Submitted in the partial fulfillment of the requirements for the award of the degree of

**BACHELORS OF ENGINEERING**

**IN**

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## **ABSTRACT**

The project presents an accelerometer-based digital pen for handwritten digit and gesture trajectory recognition applications. The digital pen consists of a tri-axial accelerometer, a microcontroller, and an RF wireless transmission module for sensing and collecting accelerations of handwriting and gesture trajectories. The proposed trajectory recognition algorithm composes of the procedures of acceleration acquisition, signal preprocessing, feature generation, feature selection, and feature extraction. The algorithm is capable of translating time-series acceleration signals into important feature vectors. Users can use the pen to write digits or make hand gestures, and the accelerations of hand motions measured by the accelerometer are wirelessly transmitted to a computer for online trajectory recognition. The algorithm first extracts the time- and frequency-domain features from the acceleration signals and, then, further identifies the most important features by a hybrid method: kernel-based class separability for selecting significant features and linear discriminant analysis for reducing the dimension of features. The reduced features are sent to a trained probabilistic neural network for recognition. Our experimental results have successfully validated the effectiveness of the trajectory recognition algorithm for handwritten digit and gesture recognition using the proposed digital pen.