Activity Recognition for Personal Time Management

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Abstract. We describe an accelerometer based activity recognition system for mobile phones with a special focus on personal time management. We compare several data mining algorithms for the automatic recognition task in the case of single user and multiuser scenario, and improve accuracy with heuristics and advanced data mining methods. The results show that daily activities can be recognized with high accuracy and the integration with the RescueTime software can give good insights for personal time management.

1 Introduction

Activity recognition is a popular research area since the 1980s, when camera based methods have been developed, but due to the fast advancement in small sensor technology, it is gaining even more attention in the past few years. Since the first sensor based results [11], activity recognition has been used for the surveillance of medical patients [7], providing context-aware information [29] and many more in military and public domains [3]. The algorithmic results are very promising and activity information could be used in many ways, but so far there is no widespread application of this recognition technology.

Furthermore, our life is getting faster and information workers try to be as efficient as possible which made a hype for time management theories, like GTD (Getting Things Done [1]) and gave birth to many software applications which track the time that we spend in front of our computers (e.g. RescueTime). They can give detailed statistics about the time spent with specific applications and documents, and they can even provide suggestions on managing our time better.

As computer usage is continuously shifting towards mobile, we have no information about the context in which we are using our devices, and of course there is a significant amount of time that we spend without using them. Mobile activity recognition solutions can provide additional information about our context and activities even when we are not using electronic devices.

2 System Description

Our goal was to design an activity recognition system that can be used in real life for personal time management. We have used a regular mobile phone and a
small external accelerometer sensor (SparkFun WiTilt v3.0) which was accessed via Bluetooth connection and placed in a belt case, so we could easily track its orientation which makes the recognition easier. It is not a serious limitation as many people uses belt cases, but it is possible to extend our recognition tests in the future for other mobile wearing habits.

For the data collection period, we have created a mobile application that helps to collect annotated data about our lives that can serve as training data for the recognizer algorithms. We have decided to pre-define 10 daily (or weekly) activities: walking, running, working (while sitting), watching television, cooking, vacuuming, taking stairs, using the elevator, traveling on a bus, lying. These activities have been selected because they are done frequently and they might be of interest from a personal time management perspective. On the mobile screen, the user can select from the list of these activities, which starts the data collection to the memory card or the phone’s internal memory. The user can always change the activity in the list or stop the data collection. The application is written in mobile Java, so it can run in the background and seamlessly track longer activities too.