Poster: On-Wearable AI to Model Human Interruptibility

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CCS CONCEPTS

•**Human-centered computing** → **Activity centered design;** *Mobile computing; Ambient intelligence;* **Mobile devices; Interaction design;**

1 INTRODUCTION

Understanding human interruptibility has a profound implication on computational user experience in a mobile setting. Many studies have explored this challenging topic and more recently in the context of mobile notification management [2]. We aim to further augment this rich body of literature by presenting a multi-modal wearable sensing system to model personal and social interruptibility. Our system runs as a background service of a wearable OS and is built on two key techniques: i) online learning to recognise interruptible situation at a personal scale and ii) runtime inference of opportune moments for an interruption.

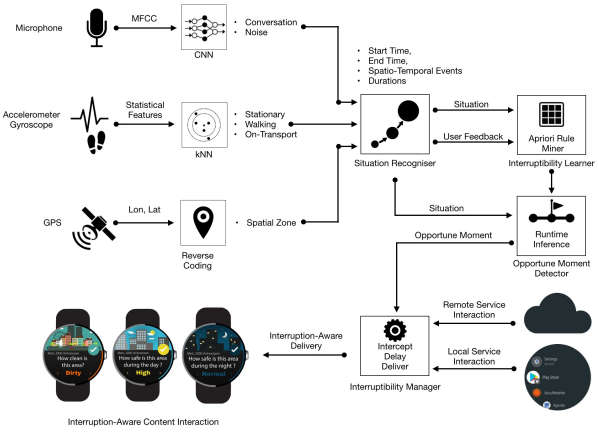

Figure 1: On-Wearable Interruptibility Management System

2 SYSTEM DESCRIPTION

The principal objective of our solution is to identify opportune moments for an interruption in a mobile setting. We achieve this by modelling spatiotemporal situations of a user, qualifying them with interruptibility labels and then using this behavioural understanding to drive opportunistic interactions. To this end, we have designed a system comprising following critical components as illustrated in Fig. 1.

Situation Recogniser: This component continually tracks the spatiotemporal trajectory of the multi-modal context attributes - conversational activity and physical activity at different semantic spatial zones - modelled with a convolutional neural network with audio based MFCC, KNN with statistical features, and reverse geocoding respectively.The sequence of these events in the configurable time window yields a situation for a user.

Interruptibility Learner: This module engages users to qualify situations with interruptibility and then applies associative rule mining using Apriori algorithm to learn interruptible situations [1].

Opportune Moment Detector: This component compares current user situation with the learned behavioural patterns to discover opportune moments to interrupt the user.

Interruptibility Manager: This module utilises the opportune moments to negotiate with native OS in delivering content at the right moment.

These system components are implemented as a set of Android Services on top of Android Wear (now Wear OS) v1.5, targeting Android Platform 22, potentially working on almost every Wear OS device in circulation. In our case, we have used LG Urbane 2 watch. These services communicate with each other and with the Android Notification Manager via Android Intents and deliver the information contextually.

3 PRELIMINARY EVALUATION

While we envision the primary use of our solution in wearable notification management, we have evaluated this system in a crowdsourcing solution with a mobile workforce of a national postal service. Six postal workers wore the watch embedded with our solution for ten days to collect spatiotemporal data (e.g., cleanliness of a street, traffic sign condition, etc.) opportunistically in addition to their primary task of delivering letters and parcels. In the first eight days, we trained the systems to learn personalised rules while the workers gather data with random interruption. In the last two days, we applied our opportune moment detector and interruptibility manager and observed a sharp 46% increase in the response rate with an average response time of 53 seconds.

REFERENCES

[1] R. Agrawal et al. Fast algorithms for mining association rules. In VLDB 1994.
[2] A. Mehrotra et al. Intelligent Notification Systems: A Survey of the State of the Art and Research Challenges. On arXiv,1711:10171

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