Ubiquitous Know-How Transfer Based on a Mobile Learning and Classification System

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1 Introduction

As the combined wealth of knowledge and experience of the human race constantly grows, we are increasingly required to acquire more experience before becoming productive members of society. The result is that individuals are specialized to be experts in a single domain over which they maintain set of experience and knowledge (know-how). Never the less, an individual is often required to apply a specific skill-set from a different domain for a specific application, which until know-how has had to be learned by that individual. We propose a system which is based on machine learning approaches to support the transfer of know-how [4] from one individual to another, allowing the target individual to apply that know-how without having to learn it.

This video introduces our mobile know-how transfer system. It is a smartphone application which acquires experts' know-how based on various machine learning and classification algorithms using the phone's sensors (e.g. accelerometer, microphone, GPS, camera, etc.). Expert know-how can be applied using the system at any time and can be shared using the "know-how market". This app facilitates the rapid collection, collation, storage, and dissemination of information, thereby facilitating know-how transfer.

2 Implementation

To motivate the necessity for a know-how transfer system using smartphones, we present a demonstration of the uses of this concept using classification algorithms. The implemented app runs on Google Android smartphones and provides an innovative solution for sharing expert domain knowledge.

As with conventional, user-taught classification approaches [2], the expert records and labels phenomenon from their domain, but supplying their expert opinion as a label. The distinction of using the expert's opinion rather than the objective ground-truth allows the system to classify phenomenon, where measuring the ground truth would fundamentally change the nature of the problem, or

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where acquiring the absolute ground truth would require waiting for long periods of time. Conventional recognition techniques [1–3] are used to extract features, which are uploaded to the server (i.e. "know-how market"), where training is performed [2]. Different apps are generated based on the experts' knowledge in different domains and can be downloaded to apply the specific expertise.

2.1 Video

The video shows several scenarios which benefit from the presented know-how transfer approach. The Watermelon scenario shows how the system can be quickly trained to transfer know-how without having to acquire the absolute ground truth: selecting ripe watermelons without having to cut them open. Watermelon connoisseurs (domain experts) claim to be able to recognize the ripeness of a watermelon based on the sound generated by thumping the rind (know-how). Such an expert can quickly train an app by supplying the test sample with their opinion of quality as a label, without having to open a single melon.

Other advantages of the concept are illustrated by the Used Car Sale scenario: mechanics (domain experts) can listen to the sound and vibration of a car's motor and quickly give their opinion as to the longevity of the vehicle (know-how). Training conventional algorithms based on ground-truth would require waiting for the car to fail, which may take years, whereas the expert's opinion based on their know-how is immediately available. Training a know-how transfer app based on this information allows a layman to apply that expert's know-how (right or wrong) in their domain without having to learn to recognize healthy motor sounds, or wait to gather the absolute ground-truth.

3 Conclusion

In this video we presented a smartphone-based classification system for transferring domain specific know-how between individuals. Since the entire process is independent of the underlying classification technology, applications are only limited by the level of expertise of the creator over their own domain and the abilities of the device's sensors, and not by the phenomenon themselves.

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