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General Article

Crowd sourced Human Computation on the Smartphone Lock Screen

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Abstract

There are a lot of repetitive tasks being performed by humans every day. This predictable repetitive behavior can be capitalized to perform certain tasks that need human intervention. Many researchers see today the great opportunity this presents to crowd source valuable information. Human-based computation (HBC), human-assisted computation, ubiquitous human computing or distributed thinking (by analogy to distributed computing) is a computer science technique in which a machine performs its function by outsourcing certain steps to humans, usually as micro work. In this paper, I present an Android application which makes use of the common habit of today's smartphone users of checking their phones at regular intervals. This behavior can be used to answer simple yes/no questions or instances where a single tap is enough for giving out relevant information. This can be used in scenarios where machine results are not full proof and need some kind of human intervention to confirm the results. For example, Optical Character Recognition (OCR) software is known to have an accuracy rate between 81% to 99%. This method can be used to validate the results of the OCR software.

Keywords: *crowdsourcing, human computation, lock screen, mobile crowdsourcing, microtasking.*

1. Introduction

In traditional computation, a human employs a computer to solve a problem; a human provides a formalized problem description and an algorithm to a computer, and receives a solution to interpret. Human-based computation frequently reverses the roles; the computer asks a person or a large group of people to solve a problem, then collects, interprets, and integrates their solutions.

The success of crowdsourcing for human computation depends on the participation of the people. Mobilizing participation is a central challenge for every crowdsourcing campaign. Campaigns that cannot motivate enough participants will fail (A.R.Poteete *et al*, 2010). A lot of crowdsourcing campaigns fail due to the amount of time it takes for someone to be contributing towards it. In order to overcome this challenge, there needs to be a way in which the participants do not need to spend a lot of time in participating in a crowdsourcing campaign.

Some of the existing repetitive tasks that we perform in our daily lives can be harnessed for human computation; such that the normal course of actions are not disrupted in any way and the people continue doing what they were supposed along with contributing to crowdsourcing. A good example of this is reCAPTCHA; reCAPTCHA is a user-dialogue system originally developed by Luis von Ahn, Ben Maurer, Colin McMillen, David Abraham and Manuel Blum at Carnegie Mellon University's main Pittsburgh campus, and acquired by Google in September 2009. Like the CAPTCHA interface, reCAPTCHA asks users to enter words seen in distorted text images onscreen. By presenting two words it both protects websites from bots attempting to access restricted areas and helps digitize the text of books.

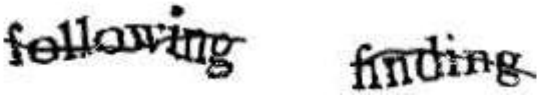

Fig 1: An example of a reCAPTCHA challenge from 2007

reCAPTCHA technology was developed not merely with an eye toward improving cyber security, but also as a way to harness and reuse the collective human time and mental energy spent solving and typing CAPTCHAs. reCAPTCHA has worked on digitizing the archives of The New York Times and books from Google Books. As of 2012, thirty years of The New York Times had been digitized and the project planned to have completed the remaining years by the end of 2013. The now completed archive of The New York Times can be searched from the New York Times Article Archive, where more than 13 million articles in total have been archived, dating from 1851 to the present day. This shows how effective human computation can be.

Another great example is Twitch Crowdsourcing: interfaces that encourage contributions of a few seconds at a time (Rajan Vaish et al, 2014). It replaces the mobile phone unlock screen with a brief crowdsourcing task, allowing each user to make small, compounded volunteer contributions over time. Twitch crowdsourcing allows

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designers to tap into local and topical expertise from mobile users. Twitch supports three unlock applications:

- Census
- Photo Ranking
- Web structuring

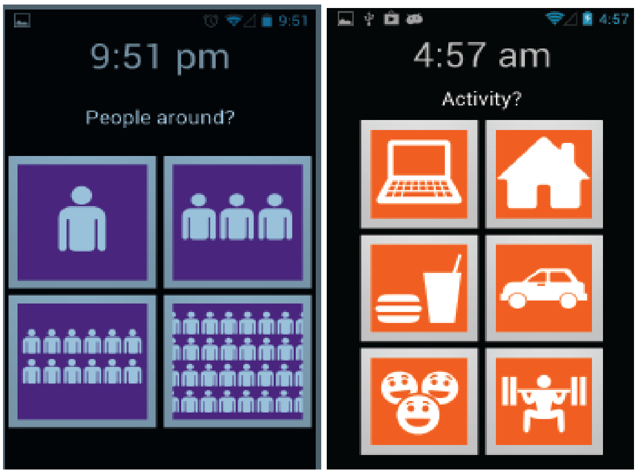


Fig 2: Twitch crowdsourcing asks for one to two seconds of users' time each time they unlock their phone.

This paper aims at showcasing some other useful use cases of harnessing a common human behavior; that of unlocking the smartphones at regular intervals. The Kleiner Perkins Caufield & Byers's annual Internet Trends report suggests that average user actually checks their phone nearer to 150 times per day. This could be a huge amount of human computation efforts especially considering the fact that there are almost 1.5 Billion smartphones in the world. To demonstrate this, this paper proposes an Android app which replaces the standard lock screen of the Android device. Instead, the lock screen consists of simple tasks/activities/questions which just take a single tap/swipe. In this way, they are not spending any additional time and also contributing to the crowdsourcing effort.

Some of the use-cases that this crowd sourced human computation can support are:

•Verification Optical Character Recognition (OCR) software results.

•Verification of online translation services

2. Verification of Optical Character Recognition (OCR) Software Results

Optical character recognition, usually abbreviated to OCR, is the mechanical or electronic conversion of scanned or photographed images of typewritten or printed text into machine-encoded/computer-readable text. It is widely used as a form of data entry from some sort of original paper data source, whether passport documents, invoices, bank statement, receipts, business card, mail, or any number of printed records. It is a common method of digitizing printed texts so that they can be electronically edited, searched, stored more compactly, displayed on-line, and used in machine processes such as machine translation, text-to-speech, key data extraction and text mining. OCR is a field of research in pattern recognition, artificial intelligence and computer vision.

Thus we see that OCR has numerous applications and is used in a number of different ways. Recognition of Latin-script, typewritten text is still not 100% accurate even where clear imaging is available. One study based on recognition of 19th- and early 20th-century newspaper pages concluded that character-by-character OCR accuracy for commercial OCR software varied from 81% to 99% (Rose Holley, 2009) total accuracy can be achieved by human review or Data Dictionary Authentication.

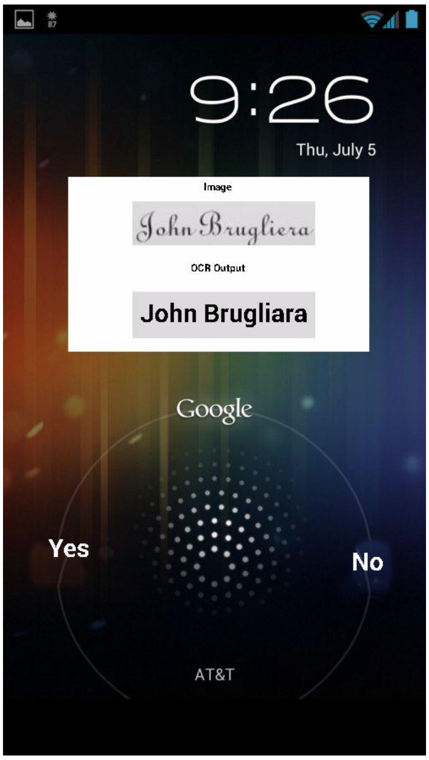
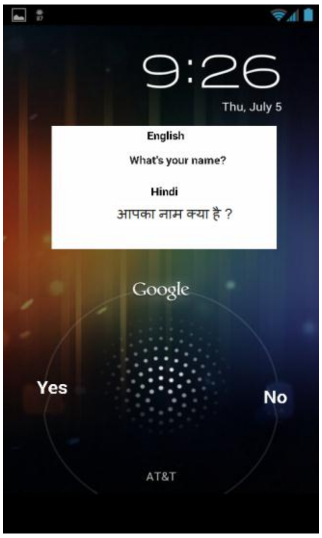


Fig 3: OCR verification on the lock screen.

To overcome this and improve the efficiency of the OCR software, this system can be harnessed to verify the results of the OCR software in applications where the correctness of the result is important. As shown in Fig.3, the users are shown the image that was the input to the OCR software and the word that was recognized by the OCR software and he just needs to verify if it has been identified correctly by a simple swipe gesture in the correct direction depending on whether the word is parsed correctly or incorrectly according to him. This is a very easy approach of verifying the results of the OCR software, especially in situations where the correctness of data is very important.

3. Verification of online translation services

Machine translation, sometimes referred to by the abbreviation MT, is a sub-field of computational linguistics that investigates the use of software to translate text or speech from one natural language to another. On a basic level, MT performs simple substitution of words in one natural language for words in another, but that alone usually cannot produce a good translation of a text because



English

What's your name?

Hindi

आपका नाम क्या है ?

Fig 4: Crowdsourcing machine translation verification

recognition of whole phrases and their closest counterparts in the target language is needed. Solving this problem with corpus and statistical techniques is a rapidly growing field that is leading to better translations, handling differences in linguistic typology, translation of idioms, and the isolation of anomalies (Thomas Fritz Albat, 2012).

The notable rise of social networking on the web in recent years has created yet another niche for the application of machine translation software – in utilities such as Facebook, or instant messaging clients such as Skype, Google Talk, MSN Messenger, etc. – allowing users speaking different languages to communicate with each other. Machine translation applications have also been released for most mobile devices including smartphones, pocket PCs, PDAs, etc. Due to their portability, such instruments have come to be designated as mobile translation tools enabling mobile business networking between partners speaking different languages, or facilitating both foreign language learning and unaccompanied traveling to foreign countries without the need of the intermediation of a human translator. Several free Web-based MT systems are available, including:

- Applied Language
- Google Translate
- SDL Automated Translation Solutions
- Windows Live Translator
- Yahoo! Babel Fish SYSTRAN

Although these systems have existed since the past few years, Machine translation (MT) is slower and less accurate than human translation and there is no immediate or predictable likelihood of machines taking over this role from humans. MT is known to be correctly translating individual words, but it is the sentences which have shown majority of the errors in Machine Translation. To verify the results returned by Machine Translation, we can crowd source the verification process by displaying the original text and the machine translated text to the bi-lingual users of the app who can then either confirm or flag the results returned by MT.

As shown in Fig.4, the user of the app is shown the original sentence and the machine translated sentence on his lock screen. At the time of sign up, he can specify the languages he is well versed with and can help in verifying the translated sentences. This will be displayed only on the lock screens of only those users who know two or more languages and of only those languages they initially signed up with. Thus, this technique can be a very efficient and fast way of finding the wrong translations and help in increasing the accuracy of these machine translation services.

Conclusion

This paper presents an Android application which makes use of the common habit of today's smartphone users of checking their phones at regular intervals. This behavior can be used to answer simple yes/no questions or instances where a single tap is enough for giving out relevant information. This can be used in scenarios where machine results are not full proof and need some kind of human computation to confirm the results. The users of this application do not spend any additional amount of time for contributing to the crowd sourcing efforts. I truly believe that this is an effective method for verifying the results that are computer generated and can help in improving the quality of such data.

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