REVIEW ARTICLE

Selfie identification app as a forensic tool for missing and unidentified persons

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Abstract

Social media applications can be valuable investigative tools in the search for missing and unidentified persons. As yet, no forensic App exists with the aim of assisting the human identification process, through the search of antemortem data to be used as adjunct data in the comparison with postmortem data collected. The aim of this article is to introduce a new application for Smartphones called "Selfie Forensic ID" App which will employ selfie and face photographs as an archive of dental data and dental features of the front teeth of missing persons sharing with Instagram, Tumblr, and Twitter Social Networks (available for free download from both Android and Apple store at http://onelink.to/selfieforensic). Features such as diastema rotated or wrongly positioned teeth, lip anomalies, recognizable fixed prosthetics, dental crown discolorations, dental or cutis piercing could represent strong identifiers in the comparison of AM and PM data. The increased number of terrorist attacks and natural disasters which result in the premature death of innocent people underlines the importance of storing personal identification data to avoid bodies remaining unidentified. The authors believe there will be an increased public willingness to share personal ID information through understanding of the ethical and administrative consequences to the families of deceased persons should bodies remain unidentified.

Key words: Dental autopsy, dental identification, forensic sciences, selfie photographs, social media, unidentified persons

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Introduction

Social media is a valuable investigative tool when seeking evidence or information about individuals or criminal cases including missing persons, wanted persons and crimes investigations in general, due to the vast amount of information available online, such as videos, photos, text posted by criminals and/or witnesses[1-3] and geolocation using online social network applications.[4]

Social networks, such as Facebook, LinkedIn, Twitter, and Google+, can provide information during death investigations, such as time and manner of death, a preliminary identification of a decedent and other circumstances relevant to the death.[5] There has been also a rapid growth in the creation of applications for smartphones to be used to find and locate missing persons,[6] after disappearing or disasters as social media can reach a wider audience. The amount of sensitive data in circulation is confirmed by the increasing numbers of

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social networking users: Facebook has grown to 1.94 billion monthly users[7] since it was first launched in 2004, and Twitter cites more than 328 million active users a month.[8] The main focus of all Missing Persons apps though is to find the missing person "alive," whereas the use of an App as an aid to identify a deceased person is not considered. To date, there is not yet a forensic application for Smartphones with the aim of assisting the human identification process, through the search of antemortem secondary identifiers data collection through social media. This new App could contribute to the possible human identification of missing and unidentified persons using visual recognition including dental data for forensic dental identification.[9]

In forensic caseworks, portrait photographs are regularly used in the search of missing persons and where applicable, in the human identification process using superimposition techniques. To this end, smile photographs constitute a reliable source of information as regards dental antemortem data collection[10] and could also be used to solve cases of human identification. The first case report paper describing the use of selfie photographs to identify carbonized human remains was published in 2016,[11] but smile photos have always been a common source of dental information[10,12] beyond all other clinical dental data.

The purpose of this technical note is to introduce "Selfie Forensic ID" App [Figure 1] which will employ selfie and face photographs to create a social networking archive of dental data and dental features of the front teeth and smiles of registered individuals.
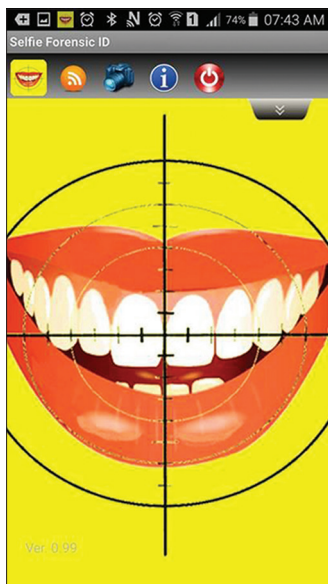

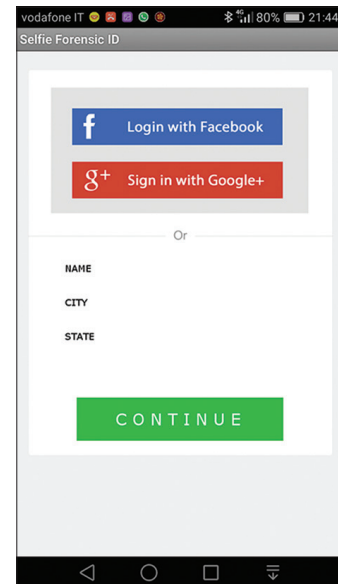Figure 1: "Selfie Forensic ID" App main screen

Figure 2: "Selfie Forensic ID" App Login or registration screen

Figure 3: A selfie picture of a smile within the centering grip of the App

Figure 4: A selfie picture of a smile within the centering grip of the App

Background and Features

The new App called "Selfie Forensic ID" is available to the public to download for free in Apple Store and Google Play at http://onelink.to/selfieforensic. Users have to register providing name, surname, city, and nationality to perform selfie photographs and have access to the App itself. Users have the option to activate the geolocation feature, which will be recorded as GPS (Global Positioning System) coordinates in the name of the images stored. The App also allows a login using one's Facebook or Google+ profile [Figure 2]. If the user uses these feature data already authorized through the above social media, will be available to our App.

The App also has other utility tools to increase the number of potential downloads: Passport and ID photo maker, a "mirror" tool and an "emergency-alert" button tool. This latter – if the geolocation is authorized by the user – will send a customized alert message and the actual geographic location by SMS to a specified phone number. To activate the alert message, the user simply needs to touch and hold the Selfie Forensic ID App icon on the main screen for more than 2 s.

The Selfie smile imaging tool works with a designed grid which helps the collection of a better-centered images of the lower third of the face and front teeth as they appear in a smile [Figures 3 and 4]. The images taken are then extracted and shared with two social networking application, Instagram, Tumblr, and Twitter [Figures 5 and 6], with the name and other tags as follows: Images are archived with name, surname, city, country telephone code (e.g., "39" for Italy), Country, GPS coordinates (if authorized by user), and date of publishing.

Once the Selfie photo is confirmed by the user, it is automatically sent to an archive in cloud managed by the App owner. This is to verify the photo is an actual smile photo with the correct name and prevent the sharing of wrongful images or fake names. All verified photos will be shared to Twitter (@selfieforensic), Tumblr (@selfieforensicid), and Instagram (@selfie.forensic.id). Selfie Forensic ID profiles which are mutually synchronized. The image will be available in any internet search engine when looking for a missing person and unidentified person, thus representing extra antemortem dental identification data, able to narrow the search of compatible/incompatible profiles.

Full list of App features includes:
1. Create Passport photo, Visa Photo, or any ID photo using the front or back facing camera and print directly from the Smartphone
2. Mirror tool. Like any other mirror App, it uses the front-facing camera to function as a mirror
3. Create front teeth and smile photos using front camera thought the grid guide
4. Extract only Selfie photos to Instagram, Tumblr, and Twitter
5. Optional: Emergency alert messaging with geographic location.

Discussion

Forensic dental identification is performed through a comparison of postmortem dental data with antemortem dental profiles of missing persons.[13] Usually, forensic odontologists will search for antemortem data coming from dental clinics and hospitals X-ray images, dental casts, palatal rugae[14] but also portrait pictures showing front teeth collected by the next-of-kin, from the Internet[12] and other means other than dental radiographic comparison.[15] Features such as diastema, twisted/tilted teeth, teeth rotations and transpositions, missing teeth, supernumerary teeth, crowding of teeth, tooth sizes, enamel hypoplasia,[16] lip
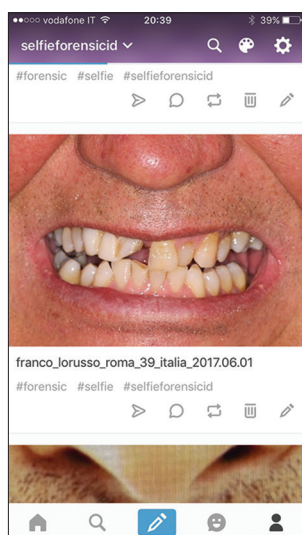
Figure 5: The images taken as it appears on Tumblr, with the info registered

Figure 6: The images taken as it appears on Twitter. If the user authorizes the geolocation, the name will also contain the GPS coordinates

anomalies, recognizable fixed prosthetics, dental crown discolorations, dental or cutis piercing could be present in the missing persons profile and could be crosschecked during the dental autopsy of the unidentified cadaver.[17] For this reason, smile photos represent one of the most common sources of dental information, especially when no technical antemortem dental data has been yet received from the families or next of kin.[12]

Internet images search of a name/surname may reveal photos of the face and the smile of a missing person with a biological profile compatible with the postmortem data. The dental variations and characteristics become an aid in the comparison process of antemortem and postmortem match thus confirming or excluding the identity of one or more individuals.

The new App will be able to increase the quantity and quality of selfie images of the lower third of the face showing front teeth and identifying features.[17,18] To facilitate the search among homonyms, all selfie pictures taken thought "Selfie Forensic ID" are saved and published with name, surname, location, and geographical location if authorized. For privacy reasons no other information is stored, as the goal of the App is the archiving of smiling Selfie pictures of people and make them available through social networking to enhance the antemortem dental data searches of missing persons and aid forensic dental identification.

In the authors' opinion, the increased number of terrorist attacks and natural disasters which result in the premature death of innocent people will progressively spread the importance of storing personal identification data to avoid bodies remaining unidentified.

Conclusion

The increased number of terrorist attacks and natural disasters with the ethical and administrative consequences to the families of deceased should a person remain unidentified will increase the public willingness to share personal ID information using web and social media. Selfie photographs - as those created by "Selfie Forensic ID" App - and social networking services represent the easiest, cheapest, and fastest way to disseminate personal individualizing data and identification images and can represent an aid in the process of forensic human identification process of unidentified persons.

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Conflicts of interest
There are no conflicts of interest.

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