Bluetooth Low Energy (BLE) for Covid-19 Contact Tracing Using Smartphones in Four Different Scenario

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SUMMARY

This work deals with the effectiveness of developed smartphone Apps for contact tracing for COVID-19 that are based on Bluetooth LE (low energy) to detect contacts. Many applications based on BLE technology were developed in the past year to track the contact of people. Applications are based on how close two people are in accordance with the distance derived from the received signal strength indicator (RSSI). The paper is a more detailed study based on different types of smartphones, analysing the different factors that affect the value of the RSSI records. Thus, it describes a method and analysis for determining whether two phones, carried by humans, were in persistent contact from up to 6 meters for 5 minutes using Bluetooth LE signals. In this aspect, too, numerous methods for positioning smartphones were used so that the effectiveness of the study is as clear and precise as possible, but also to highlight the quality of intelligent devices. Experiments were carried out in four scenarios, in which the smartphones were either placed unhindered in open space on chairs, stowed in backpacks or handbags, in the user's trousers pockets and behind a wall. The results of the analyses shows that several factors have a decisive influence on the signal quality. While Bluetooth technology has proven to be very useful, it is not always easy to convert Bluetooth RSSI measurements into distances between different mobile devices. The results also indicate that in most cases, especially in the near range between the devices a meaningful relationship between the RSSI values and models based on an approximation with a logarithmic path loss model can be derived. Sensitivity and specificity are also two parameters that were part of the analysis. These parameters are usually used in medicine to see if a patient is ill or affected. Therefore the sensitivity and specificity methods were used for better analysis and result for correct positive and negative cases. In most cases, the true positive and negative cases could be detected. However, the results of the trousers pocket experiment showed unexpected distributions due to the low granularity of the sampling points.