

Combating pandemics with Mobile or IoT technology submitted to Liverpool Hope University

Ciarán Adams

IoT Assessment

Computer Science, Liverpool Hope University

Abstract

This paper will discuss how IoT and Mobile technologies could help reduce the spread of pandemics, in addition to this the dangers these technologies could impose. No background information is needed as the paper will explain What IoT is and how it works. The discussion will include ways/theories on how IoT could be implemented into the world to reduce the spread of pandemic. Ways such as Outbreak prevention, Ensuring quarantine and even patient care. Furthermore, discussing ways IoT has already been used in the current Pandemic of COVID-19 in the form of apps in the UK and China along with the Connected thermometer currently beings used in hospitals throughout china. Then all of these finding will be analysed to determine whether or not the dangers outweigh the benefits of using IoT, instances such as surveillance and privacy concerns which could be taken advantage of from governments and companies alike.

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Intro & Background

This paper will discuss how may Mobile or IoT technology be used to combat the spread of pandemics and what dangers and indirect advantages may there be in doing this? This will be done by going over theories, journals, news even times its genuinely been used in practice. This is a topic of great concern especially during these troubling times of the global pandemic known as COVID-19.

What is IoT?

IoT is an acronym which stand for Internet of Things, it is a system of computing devices that are interrelated, digital and mechanical machines, people, animals or objects that are given unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

Essentially this means taking all the things in the world and connecting them to the internet. This includes integrating everyday normal household items with sophisticated technology such as smart TV's, driverless cars, smart locks and so on. This is done with the use of sensors, that then transmit the data to a computer or software this allows them to complete important tasks.

Is IoT ready?

IoT has immense potential, for IoT too reach its true potential every device would require the ability to communicate with one another despite the brand or company they belong to. Information would need to be safe guarded as the companies collect the information from its users.

Area of focus

In this section of the paper theoretical methods using IoT will be discussed to explain how exactly mobile or IoT technologies could help in combating the spread of a pandemic in the future. COVID-19 has spread extremely fast, it has exposed many problems in the government health response systems. It can take a tremendous amount of human resources to trace the origin of an outbreak, treating patients, setting up quarantine, preventing cross contamination and this can accelerate the strain on the system even further. So how can IoT help?

Outbreak Prevention

For a start IoT can have use to track an origin of an outbreak, a recent study by researchers at MIT used aggregated mobile phone data to trace individuals. This has an almost perfect potential to track the origin of a pandemic in addition to locating other individuals that may have been infected. With this overlaying geographic Information System, the ability to locate patient zero and identify the individual who have come in contact is far safer than sending individuals in to investigate. This also has the potential to be effective at extremely efficient speed, the ability to stop a pandemic before its even begun.

Ensuring Quarantine

IoT gives the public health personnel the ability to monitor if any patient that has been infected complies with quarantine. If a patient were diagnosed and told to go into quarantine the health personnel would know if they breach quarantine and know who else would be able to see who else they've been in contact with to find out if they also have been infected. This is done the same way as the outbreak prevention making use of the Overlaying geographic information system.

Patient Care

One of the most essential roles during a pandemic are the health care workers who take care of patients. Be it taking temperature, bloods, daily check ups even door to door to ensure the safety of all patients. This requires individuals to get close to affected patients and in turn risk getting infected themselves (particularly during a PPE shortage). The problem is that all of this is done manually increasing the spread or risk of spread substantially. One-way IoT can help with this is to give the ability to monitor most if not all of these things from a distance. The Patients could have their temperature taken and upload their data to the cloud using their mobile device. This helps the healthcare workers reduce time and reduce cross infection with patients. It's quite clear from recent event that healthcare services have a heavy burden due to the limited resources being stretched beyond capacity, reducing the need to touch would be near perfect for controlling a pandemic.

The technology within IoT to assist the healthcare sector does exist however, the system will need to build up its infrastructure in order connect the components of processing, storage and data collection because as of right now the system is scattered and not yet connected.

Results and findings

IoT has already been used in ways to help combat the current pandemic of COVID-19. This section will discuss what was done using IoT and is it effective or dangerous?

The Concept, the dangers, how it helped

Contact Tracing apps

In early February 2020, china launched the close contact detector app. The goal of this app was simple, too alert those who are in close contact with those who are suspected or have the virus COVID-19. The idea is that it would make people take more precautions around those who may have the virus and go into quarantine, which in turn would see a decline in the spread of the virus. Many concerns have been raised as the app asks for personal info such as phone number, name and ID Number in addition to this the app will have your location. This is a concern as the Chinese government are known for heavy surveillance of its citizens and many fears this is the next step. Overall the app does seem to be a great idea with some concerns over privacy.

The UK have a similar app known as the “NHS Track and Trace app”, the goal of this system is too let citizens know if they have been in close contact with someone who later is confirmed positive for COVID-19. Essentialising those who need to quarantine and those who don’t, individuals who come into contact with within 28 days to those who have been confirmed with the virus will receive a ping message and recommend to self-isolate as they may have contacted the disease. However, in order to protect privacy concerns the app does not tell you who you have contacted the virus from. In addition to this the data that’s stored on the app will be deleted after the apps use and the pandemic is over. The technology in use is done using Bluetooth signals which is considered IoT as despite its name, the Internet of Things (IoT) is not constricted to purely internet-based connectivity.

Connected thermometers

This device has been built by California based connected health start-up VivaLink’s. It uses a temperature sensor that provides real time monitoring of changes in body temperature continuously. The data is then transmitted to a nurses station and the gateway allows for up to forty low energy Bluetooth devices, that are all connected and paired continuously.

Connected thermometers are being used in hospitals for screening patients and staff. Hospitals throughout china seem to be the main uses of the connected thermometer, however McDonalds store in the UK will be testing all of its workers every day using wireless thermometers which in turn helps prevent the disease and also allows the economy to regain strength by having the ability to get temperature tested at work wirelessly.

Contactless payments

Contactless payment has been a successful IoT technology for a while and has been growing for years and during the current pandemic its popularity has risen sorely. They were first available in the UK in 2008. Many stores only taking contactless payments is great as it helps to have a nationwide "contactless" payment system when you do have to pay for groceries and other essentials in person. The wireless connection from contactless cards are done with the use of a “near field communications chip” which is built into the card, this allows the card to establish a connection with a point of sale payment terminal. As contactless doesn’t require the user to input their pin, it greatly reduces the spread of the current pandemic, a feature which was unintentional and yet has become an extremely useful tool combating the pandemic.

Analysis

This section of the paper will try to analyse whether the good from IoT outweighs the bad.

The Bigger Picture

It's abundantly clear that the technologies for outbreak prevention, ensuring quarantine and patient care are extremely promising and although the correct infrastructure is not yet in the place this does seem to be the future for hospitals during pandemics or even on a daily basis. The ability to reduce spread and reduce workload is imperative in today's world with such a high global population this technology does seem to be an absolute necessity for future pandemics. However, for this to happen these technologies must be studied more, particularly in practice as if a system is faulty, unreliable or easy to hack then it will add additional strain to the healthcare sector doing the complete opposite as intended. In addition to this hospital would need a boost in funding, which is not always easy to obtain. However, promising this technology is, it will take time for it to become a reality on a global scale. The problem with the mobile tracing apps is that it requires the user to "be honest" and to "do the right thing", this cannot be relied on for a pandemic in anyway there are always those who do not trust a technology that's "new".

The technology does appear to be there, yet it does require a lot more testing on larger scales. As mentioned before fear will always play a factor in "new" technologies and the sad truth may be that the public will not be ready for a long time. The issue of surveillance can only grow as future intelligent services might use IoT technology for identification, surveillance, monitoring and so on. This can be seen a lot particularly in today's world, blatantly mistrusting 5g and vaccines on false information. The privacy concerns are an absolute understandable concern, medical history is private for a reason and should always continue to be so. However, over time encryption will become more secure the data more difficult to be stolen from hackers. But the concern will always be there for governments and companies using the data for their own purposes such as advertising and selling it which has been a growing problem for the past few years.

Conclusion

Possibilities for the future of IoT in combating pandemics and current practices have both been discussed in this paper. IoT is a broad range of technologies the possibilities are endless, its hard to predict what other technologies may rise in the future. There are some serious positives and negatives which have been discussed, both compelling arguments for how, when and if it should be used.

To conclude this paper, the essentials for IoT are all there it's just a matter of is it worth it. Just like every technology there are risks and high costs IoT is no exception. With the correct investments IoT will one day be used to combat the spread of pandemics, if anything the global COVID-19 pandemic has fast-tracked when the technology will be used as the new normal. However dangerous it may be the benefits surely outweigh the costs, with what will more than likely be a few individuals getting data stolen. However, saving many lives and the economy will be hard to turn IoT down for combating Pandemics in the future to prevent a nationwide shut-down that can be seen today.