Location Tracking and Security in Information Technology

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Abstract— Technological innovations in information technology have become very famous across the globe. Many of these technologies have great merits but they equally pose threats in security and privacy. One of such technologies is location tracking. The main objective of this technology is to ensure security and safety. This service uses information on the geographical position of a mobile device or uses Radio Frequency Identification Tags (RFID) or Closed Circuit TV cameras (CCTV) to track locations. It is used in areas such as health, indoor object search and personal security. It is used to identify the location of a person, which most American parents use to track the movement of their children. This service is also useful in tracking stolen items such as cars, mobile devices and laptops, store products and also very useful for the police in tracking criminals.

The paper outlines three major types of location tracking technologies and indicates how they are applied. The types include the use of GPS on mobile devices for, Radio Frequency Identification Tags (RFID) and CCTV video surveillance all for tracking purposes. Furthermore, the paper addresses the importance of location tracking, with great emphasis on its specific usefulness across the globe. In that regard, the pros and cons of the technology will be identified. Additionally comparative advantages will be discussed and eventually deduce whether the technology is of great importance or not.

Also, as a concern to many people, the issues of privacy and security cannot be ignored especially with the location tracking technology. Even though many have admitted the great help it has been to them, there is still a feeling of insecurity among them as they vehemently argue that their privacy is being invaded. Specific concerns of people will be discussed and identify possible recommendations and or solutions

Index Terms— Radio Frequency Identification Tags (RFID), Closed Circuit TV cameras (CCTV), video surveillance, security, privacy rights.

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Introduction

Over the years, location tracking has become a very vital aspect of life. Even though it comes with several benefits, people have also been worried about the extent to which their private lives are tracked. Indeed, when it comes to the gains, location tracking helps in monitoring the movement of people closely and especially parents who are concerned about the whereabouts of their children, this is a great tool for them. Also, the law enforcement agencies, use this tool to track criminals and so for them as well, it is yet another gain. However, for the ordinary man who is being monitored and tracked during their everyday activity, the worry has always been that their privacy is being invaded.

This research paper identified the various forms of tracking through the means of mobile devices, radio frequency identification tags (RFID), as well as video surveillance systems. Certainly, there are both pros and cons to the use of these technologies and they are clearly identified as part of this research.

Also, as a matter of concern, the United States government has passed privacy acts and children protection acts so as to at least limit the extent of tracking activities. The details of these acts will be discussed as well as identify some of the best ways to fight for ones privacy rights. Certainly, for many people, their major concern is the fear of being secured as they feel that anybody besides security agencies can have access to these tracking tools and make them targets. Security and the governments on the other hand feel the surest way to grant their people security is to be able to use these tracking tools to identify law breakers and other criminals.

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1. Location Based Technologies

i)   Location Based Service on a Mobile   Device

This technology uses geographical locations to track the movement of objects and people with the aid a mobile device. Most telecommunication service providers have this service imbedded in cell phones and it is able to indicate the location of any person or object carrying the phone. Other mobile devices have also been built with this service which can be attached to a vehicle to track its movement. The Global Positioning System (GPS) continuously broadcast the location as well as the date and time on the devices and the monitoring party gets the broadcasts and therefore makes it possible to determine the location of a person or object. This has become quite a popular way many parents monitor the movement of their children.

Incidentally, some school districts in the United States are investing heavily in the technology to ensure that school children riding the school buses are monitored throughout the time they spend in the bus. Specifically, Location tracking device have been attached to the buses and the children that need the service are given a special identification cards which records anytime they get on or off the bus. Also, the parents of these children are given special codes which make it possible to track their children on the internet. In some cases, the parents are able to see the videos of their children while in the bus. The technology enables school authorities to determine if the drivers transport the children safe and prompt. Furthermore private individuals and law enforcement agencies are able to use similar devices to track the movement of vehicles. For the police in particular, these devices are usually secretly attached to the vehicles of suspected criminals to enable them monitor their movement. Also, some private transportation business operators have these devices attached to all their vehicles to monitor their drivers and also enhance transparency in their business.

In related developments software developers have developed several applications which can be downloaded either onto a mobile phone or the computer and are used for tracking purposes. Some of the common applications include; Life360 – Family locator, Glimpse, GPS location tracker among others. A lot of people are getting attracted to these location services but many people still have their reservations.

ii)   Radio Frequency Identification Tags (RFID)

Radio Frequency Identification (RFID) tags are small chips with antennas that communicate with RFID readers. Generally, these tags are used on consumer products which make it easy for store managers to tell when products leave the store.
In an effort to address child kidnapping, some clothing designers are contemplating incorporating RFID tags on children's clothes so that parents are able to track their movement. The principle is the same as tracking the movement of other products with the tags attached.

Also, some super markets have begun tagging their clothes and other products to make it easy for them to identify stolen products. Even though the intent might be strictly business related, there is also the possibility to track the movement of the wearer of those clothes as the RFID device returns feedback to computers which can be monitored all the time. One can argue that just because the tags don't include any personal information there should not be anything to worry about. However, the fact still remains that people's movements can be tracked and that could be a great concern for many people.

Additionally, some famous companies imbed RFID tags in clothes, shoes and others so that they can track places where people visit so that they can identify their likes and dislikes. This is done strictly for advertizing purposes. Furthermore, some libraries imbed these RFID tags inside the cover of books and are able to determine the location of the books. Therefore if anybody borrows any of such books, the location of the book can be traced to get to the person.

RFID is increasingly becoming popular especial among businesses who are determined to implement technologies that will help them check theft cases and also improve upon their business management. However, there is still a large group of people who feel their privacy is at risk.

iii)   Video Surveillance Technology

Perhaps this is the most common among the location trackers. This technology uses surveillance cameras mostly closed circuit TV cameras (CCTV) to capture live activities of people and also has the capability of keeping records of people and use them for several purposes. Indeed, governments, supermarkets, shop owners, institutions, corporate organizations as well as private individuals across the world, use the technology. Certainly, what this means is that individual privacy is gradually diminishing as CCTV cameras are scattered across cities and public places.

It is believed that most countries are heavily depending on the CCTV technology to help beef up security. It is on record that about 4.2 million CCTV cameras are in operation in all of Britain and about 2.75 million CCTV cameras in China. Also in the United States, it is on record that the department of Homeland security receives video feeds from about 4,500 surveillance cameras across the Washington DC area. All the other states in the United States make use of CCTV cameras extensively for several purposes. These staggering numbers are just a confirmation that individuals have lost most, if not all of their privacy especially in public places. Shopping malls are no excep-

tion, right before you ingress the building, you are greeted by a camera and as one moves within the shop, every movement is being captured.

Additionally, CCTV cameras have been installed on the streets, by traffic lights and public parking lots so it is most likely that people who visit any public place will have a record of them stored in some system certainly unknown to them. Surely, no one can say what happens or will most likely happen to those records. Even more, ATM machines also have these cameras installed on them and so they are able to capture the transactions that occur in the booth and this is even more alarming.

Well, it is obvious that society has probably accepted the influx of surveillance systems as part of life and so not many people seem too concerned about it. It could also be because of that court ruling with respect to the fourth amendment that states that without a reasonable expectation of privacy, there is no privacy right. Therefore it is not likely to find these cameras in public places reduce in the near future.

2. Pros and Cons of Location Tracking

Most of the companies or organizations that make use of location tracking devices argue that their intentions are positive. Indeed, the school districts that decided to attach mobile tracking devices to school buses did so to ensure safety of the children, and parents are able to monitor and know what happens to their children as they leave home for school. Also, the same technology makes it possible to monitor movement of bus drivers and ensure that school kids are dropped off on time and picked up on time.

The people that use mobile tracking devices to monitor the movement of family members and loved ones have an intention of checking the whereabouts of their relatives in case they are stranded somewhere. The police also use it to track and flush out criminals. Interestingly, some of the mobile applications for location tracking are able to indicate the specific crimes that were committed in one's neighborhood. It goes on to point specifically to the location where the culprits live. It is also able to indicate if they have been convicted for a crime or been to jail or not. It basically gives history of specific types of crimes committed in the neighborhood.

Also, the idea of sewing RFID tags into the clothing of children was conceived as a means to address child abduction. Many store owners, bookstores and supermarkets implement this technology to prevent their products from being stolen without any traces.
The Closed Circuit TV (CCTV) cameras have been a tremendous help to society at large especially law enforcement agencies. In most crimes committed in public places, surveillance

videos have been of great help in making arrests. In the recent Boston marathon bombing, videos captured on surveillance cameras led to the arrest of the suspect. Many shop owners have used videos captured on surveillance cameras to identify thieves and other criminals. In all, video evidence is so strong that it gives the true representation of a situation. It will therefore be difficult to do away with them considering their benefits to society.

Certainly, with all the points noted above, there are many great intentions behind their Implementation and it is not very likely that many people will kick against these technologies. Most of them are really helpful in protecting the society and also give us a lot of information about the community we live in.

However, there are also some negative sides to these technologies especially with the issue of privacy and security. People argue that if technologies like these make it possible for one's movement to be tracked, then it is equally possible that people can trace them even to their homes. A lot of people believe that criminals can also use the same technologies in their operations and that puts everyone at risk. Nowadays, it only takes an application on a mobile phone to trace the location of another person. It is also of public knowledge that surveillance cameras are scattered all over so one cannot freely do certain things for the fear of cameras. This is just an indication that one's privacy can be invaded at any time. These among other reasons have been the major concerns of many people.

3. Security and Privacy Concerns in Location Tracking

Interestingly, of all the concerns many people raise regarding location tracking, the two most grievous ones are threat to security and invasion of privacy. Many people fear that location trackers which are used by the police for example to track movement of criminals could equally be used by criminals to hijack people. Certainly, it is that simple, where criminals can also attach mobile devices to vehicles of targeted individuals and trace them to their locations. This is a huge threat to security. There is also the same feeling when people realized that some clothes they buy in stores could have RFID tags imbedded in them. For the same reason, the bus driver or even the school children will have a cause to complain about invasion of privacy as they are being monitored wherever they go in the bus. In fact, it is even more alarming the fact that they could even see videos of them as they move in the bus.

Recently Katherine Albrecht a popular author of the book spy chips who also doubles as the founder of a group called Consumers against Supermarket Privacy Invasion has been leading a campaign against the practice and educating consumers across the globe on what they should know about many RFID

techniques that are exposing their privacy. She even argues that some of these RFID equipments are even inserted in human bodies to track their movement and she thought the world should be aware about this and be vigilant.

In a similar development, some parents whose children are being monitored while in school buses feel that the authorities have gone overboard by adding a video tracking of the children. They strongly feel that it takes away the right to privacy from their children.

Others also argue that it doesn't create the kind of independent, autonomous people that we want in our democratic society. However, companies that use the RFID tags for different reasons argue that people can only be monitored within a specified perimeter and so that should probably help calm the nerves of consumers. As to whether that is true or not is subject to debate.

i)   Privacy ACT of 1974
The Privacy act of 1974 defends individuals against invasion of personal privacy through the misuse of records by Federal Agencies. The act establishes control over what personal information is collected, maintained, used and disseminated by agencies in the executive branch of the Federal government.
Just going by the statement of the act, it is very emphatic that it applies only to records that are located in a system of records managed by federal agencies.

The Privacy Act assures of three fundamental rights one of which gives the right for individuals to be protected against invasion of their privacy which comes as a result of maintenance, collection, use and exposure of personal information. Perhaps, the way the act was framed made it so narrow that it sounds like the violation of the act can only be regarded a crime if it was breached by federal agencies. It is therefore not surprising that many institutions adopt the practice of tracking people and yet legal actions are hardly taken against them.

Sincerely, based on the numerous merits of the location tracking systems, it could become difficult to completely abolish it. The fact that parents feel safer especially as they can feel and see what happens to their children as they leave home for school and the fact that the law enforcement agencies such as the police depend on the technologies heavily to track down criminals which is basically a way of protecting the public, one can argue based on these that the benefits far outweigh the negatives. Perhaps that is also one aspect people consider and hardly sue companies that adopt the technology.

Moreover, several groups and individuals have campaigned against the use of location trackers but most of them just end up as complaints perhaps the law is not quite on their side. It is generally difficult to prohibit companies or organizations

from tagging their products especially when they defend their action by claims that the intentions are for prevention of theft. Possibly, the law may have to be amended to include all groups of people, and then people's concern can really be heard and addressed.

ii)   Children's Online Privacy and Protection ACT (COPPA)
The COPPA rule states that operators of websites or online services directed to children less than 13 years of age, must offer comprehensive privacy policies, notify parents or guardians about its data collection practices, and receive parental consent before collecting any data from the children.

In 2005, the Brittan Elementary School in Sutter, CA, abandoned an experimental Tag and Track program. Like similar programs, this RFID tracking used mandatory ID badges to track children's movements in and around the school. The school's board pulled the plug after several concerns were raised that the program breached children's right to privacy.

In a related development, in 2010, a Pennsylvania's high school sophomore complained that one of his teachers accused him of engaging in improper behavior at home. This was a bit scary as they sought to find out how the teacher could have gotten information about his student's activity at home. It turned out that laptops given to the students had software installed on them that enabled authorities to spy on the students and their families at home. As usual the school authorities defended themselves by saying that the software was installed to find lost or stolen laptops. However, they admitted telling neither the parents nor the students about the remote access capability.
Clearly, many parents are not aware of the extent of monitoring and surveillance on their children and this is a cause for worry. Indeed COPPA frowns at these kind of behavior and the school could be in serious trouble should they be sued.
Interestingly, children especially school children face this kind of situation in various forms but authorities usually defend themselves by giving reasons that seem to be in the interest of the children and that is certainly not likely to be opposed by parents. More importantly, COPPA is specifically available for children under 13 years old so parents and society at large should make use of the law to defend children since they cannot speak for themselves.

4. The Future of Location Tracking in the United States
It is becoming quite obvious that location tracking will be on the increase in the years to come. Currently, the public seem not to complain much about these technologies, knowing full well the effects and befits that comes with them. One can only guess that perhaps the benefits far outweigh the negatives,

therefore, people are willing to compromise their privacy for their security and safety. Meanwhile the reality is that, many of these technologies are springing up without doubt. Many institutions and corporations are investing heavily in them while governments across the world are depending on them as well.

In a recent finding, some twenty states in the United States have begun using a secretive mass surveillance tool called stingray to spy on people through their cell phones. Stingrays which are also called cell-site simulators are devices that identify and track cell phones by acting like fake cell towers, fooling all nearby phones into connecting to them. This means that the police may have already spied on individuals without their knowledge. This is one technology which is poised to spread quickly across the United States.

In related developments, the influx of license plate readers, traffic monitors among others are rather on the increase and that is what the future looks to be like. Also, law enforcement agencies have been testing new evolving tracking and Surveillance technologies which when implemented will only add to the already existing ones. One of the technologies being tested is the facial recognition software which helps the police to retrieve the criminal history of a person. The most concerning part of this software is that a picture of an individual is taken and stored in a database and anything can be done with the photo without the knowledge of the person involved.

Another technology being tested and still under development is the wide area surveillance system where sophisticated cameras are attached to an air plane and it captures images as it hovers around a city. The fear as always is that people can be seen through their windows and even in the shower or anywhere at any time.

In fact with all these technologies in the works, the only prediction about the future is that, location tracking and surveillance will become predominant in our societies in some few years to come. So far, there are a lot of these technologies in the system but it will soon become rampant as it seen as one surest way of combating crime and tightening up security.

5. Fighting for Privacy Rights

It does not seem like there is much hope for the public to get the privacy freedom they so much desire. Perhaps, the laws on privacy are a little silent on the public scenarios so not much can be done. Better still, it could also be that the positives are far greater than the negatives and therefore a comparative advantage will favor the use of tracking or surveillance technologies in public places.

Meanwhile, there are still some laws out there that also give rights of privacy to individuals. A law such as the COPPA for

instance is a law for children privacy protection. It is essential to know the laws that concern our privacy and that will help us fight for our rights in case the laws are being abused against us.

Several groups of people have sued institutions and organizations regarding the breach of the laws of privacy, in some cases they had victory and got the actions reversed while others went against them. A group of people in a California town strongly protested the use of wide area surveillance and the courts ruled that it be discontinued. Also, groups of parents in a California town of Sutter rejected the use of RFID tags to track their children because they felt the extent of monitoring will invade the privacy of their children.

Certainly, the only hope the general public or individuals have is to form united bodies and fight for the common goal of the right to privacy. That seems to be the only hope.

Conclusion

Location tracking technologies have proven to become a necessary evil. Despite the damage they can cause to an individual, the benefits they give to the same individual are so enormous. One cannot push for a law to abolish location tracking because it will even put society more at risk. Just recently, in the Boston marathon bombing, a surveillance device captured the culprit and today we have a terrorist in the hands of authorities. What about the application of tracking devices to track our school children? Definitely parents will be very much relieved if they can log into a system and see their location at any time of the day. I believe the system will help many parents quickly raise an alarm once they discover their children in wrong places.

Also, for business, it is only be a thing of joy to learn that because of tracking devices attached to their products, theft of the products had dropped drastically and therefore dividends also increase as a result. Government agencies also feel that to better govern the people, certain infrastructure such as tracking devices must be put in place. All these put together are the reasons why many people will not likely bother about doing anything to surveillance systems.

There are also the people who feel aggrieved because they believe their privacy rights have been taken away from them. However, it is looking more likely to be a trade off situation where everybody at least need these systems for security reasons but at the same time also need some privacy rights respected. This debate will continue for a long time but it is more likely that people will end up just getting used to tracking and surveillance and rather yearn to be vigilant.

Acknowledgment

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