CM2306 Spring Semester Individual Coursework

Harry Batchelor-C1816377

**What am I proposing?**

The plugin that I am proposing helps developers who are working on internet of things devices such as Amazon Echo Shows or the Google Nest hub max. These are all smart speakers with built in assistants and a camera that are connected to the internet. This makes them all Internet of Things Devices (Perera 2020). One problem that some people have with these devices is there is now way of knowing when the device is recording video of you. My plugin would automatically add code to turn on a small LED or something similar whenever the developer turns on the camera. This will make it more obvious when the camera is on and will help the user of the device know when the device is watching them. This plugin mainly tackles the Right to Assemble discussed by Wright and Raab (2014).

The one problem with having plugin would be that a developer could go in and alter the code to take it out, so the LED doesn’t light up, therefore negating the user’s privacy. This could be changed so that the code is permanently locked. The other draw back to the plugin, is it would require all manufactures to include an LED for such purpose which would make older models more susceptible to invasions of privacy.

**How does my proposed plugin make the Internet of things application development process easier?**

My plugin can make the development process for smart speakers and assistants, such as the devices made by Amazon and Google easier by reducing the human error. As said by Solovjov (2016) “even better than lists is removing the need to remember something in the first place” and “Every time there is a pattern to the actions you have to perform, make the computer do it for you.”. Here Solovjov discusses automation and taking the pressure of remembering to do a task and place it onto the computer. This is what my plugin would do. Instead of the developer themselves having to remember to code to the small LED on the computer would automatically do it whenever the specific code is written.

Another way that my proposed plugin can make the development process easier is by support older versions of the devices. This is a very simple task, but it can save a lot of time. If the creator of the smart speaker were to implement something along the lines of having an LED turn on when the camera was on, but without using my proposed plugin. The developer would need to back through all the code and add in the code for the LED, into each place where the camera turns on. On the other hand, a developer using my proposed plugin would just need to turn the plugin on and allow it to do its job, and the code would automatically be added. This saves a lot of time for the company and the developer letting them get on with other more important tasks

**How does it help protect privacy?**

This proposed plugin has some major and obvious ways it protects privacy. The first and main way that the plugin protects privacy is it strengthens a person’s right to assemble or associate with others without being surveilled. Although, when Wright and Raab (2014) discuss the right to assemble they are talking about CCTV it still applies to smart speakers with built in cameras as much as it does to any kind of camera, such as a webcam or on a phone. This is because, while the devices I have talked about might not be your typical CCTV camera they can still be used to surveil someone in their own home, or wherever the device may be placed. Even though the user has willing accepted the device into their own home, if it were to record or film without the user knowing it will be breaking the privacy of their behaviour, their actions and their privacy of association (Wright and Raab 2014), if the microphone was also on at the same time, which is likely, it will also break the privacy of communication.

When discussing privacy protection, it isn’t just someone’s face or body that needs to be protected. If these companies were to come out saying that the cameras can now record all the time in the interest of the user’s safety, but the company have also developed a method to hide everyone’s faces, there is still the problem of the way people move, what they do in day, how they dress, etc… This is the privacy of behaviour that I mentioned in the paragraph above. There is no way, other than to make the camera useless, to keep someone’s personal behaviour private. This is the same when dealing with the privacy of association, the company going through the video data could workout from their behaviour patterns who is meeting up with who and, with the use of microphones, why. This data can then be used to break the people’s, involved, privacy.

Another way that the plugin can help with protecting privacy is alerting you of any unwanted hackers. For example, someone has hacked into the device and has turned on the camera to spy on you. Well because the camera has turned on the plugin has been activated and the LED has turned on showing that the camera is recording. One such example of was shown in late 2019 when Amat Cama and Richard Zhu were able to take full control of an Amazon Echo show using an integer overflow exploit (Whittaker 2019).

Although the average user will have nothing illegal to hide from these companies, they still have their own rights to have privacy in their own home. If this privacy was broken the companies holding the data could easily sell it on to other business to get a better understanding of their user. This data can be such a wide range and can be collected on so many people, as currently there have been more than 100 million Alexa devices (Bohn 2019) and over 50 million Google home devices (Kinsella 2018), that a breach of privacy this big would bring unprecedented fallout and compromise a lot more than just the 150 million people who own a device. My plugin would help reduce this by informing people when the camera was on, so they can take the necessary steps to reduce the amount of privacy they are loosing.

**How feasible is it to develop my proposed plugin?**

One of the main flaws in the feasibility of developing my proposed plugin is it requires the manufactures of the smart speakers to add in a small LED or similar to their product. At the moment, none of the big three makers of smart speakers (with a built-in camera), Amazon or Google have an LED that could be used. This would mean that even at a later date if they did add on an LED the older models couldn’t use this plugin and would still have no indicator for when the camera is on.

Another flaw of the plugin would be the language that the developer writes each smart speaker in. For example, the Amazon Alexa is written in Node.js while the Google home Assistant is written in C++. These two styles vary at lot, each with different syntax and styles of coding. This means that for my plug in to be uniformly accepted people would only need to write in one language, unless the plugin was ported to be used in multiple different languages.

Another problem with developing my proposed plugin is you would need to be able to lock the code for the LED so the developer can’t just take it out. After a search on the internet I was unable to find a way to do this and as such would probably need to develop another method.

The 4th problem with developing the plugin is the risk that the developers wouldn’t actually use the plugin. One of the largest hurdles in the development process would be actually getting the plugin out to the developers and getting them using it.

**How does my plugin compare to other existing Internet of things development tools?**

**References**

* Perera, C. 2020. “CM2306 Lesson 1-Applications and Use Cases”, [lecture to year 2 BSc Computer science]. Cardiff University 27th January 2020
* Wright, D., Raab, C., 2014. Privacy principles, risks and harms. International Review of Law, Computers & Technology 28, 277–298.
* Solovjo, M. 2016. Human Error in Programming. Available at: <https://medium.com/@maksimsolovjov/human-error-in-programming-33e4c8be59c3> [Accessed: 31st March 2020]
* Whittaker, Z. 2019. “Two Security researchers earned $60,000 for hacking an Amazon Echo”. Available at: <https://techcrunch.com/2019/11/09/browser-bug-amazon-echo-hack/> [Accessed: 1st April 2020]
* Bohn, D. 2019. “Amazon Says 100 million Alexa devices have been sold – what’s next?”. Available at: <https://www.theverge.com/2019/1/4/18168565/amazon-alexa-devices-how-many-sold-number-100-million-dave-limp> [accessed: 1st April 2020]
* Kinsella, B. 2018. “RBC Analyst says 52 Million Google home devices sold to date and generating $3.4 Billion in 2018 revenue”. Available at: <https://voicebot.ai/2018/12/24/rbc-analyst-says-52-million-google-home-devices-sold-to-date-and-generating-3-4-billion-in-2018-revenue/> [Accessed: 1st April 2020]