Project Title: TAPP
Team Goose
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The main goal of our project, TAPP, is to make other people's already complex life a little easy. TAPP involves both, a hardware and software component. The idea here is to first place a bunch of cheap NFC (Near Field Communication) tags across your house or office workspace. Our application would let you configure what you wish to do when you TAPP your phone against one of these NFC tags. This spans a variety of options such as setting an alarm for the next day, placing your phone on silent mode when you are at work or turning on Spotify when you are just chilling in your living room. Next, when you TAPP your phone against one of these NFC tags, our application would kick in, identify the ID for this NFC tag, look for a corresponding action to be performed based on the ID and would accordingly perform the task.

The main reason why this project is interesting for us as Computer Engineers is that it is not solely a software application. There is a small, yet vital proportion of a hardware component associated with it and dealing with hardware is always an interesting experience. The next best part about this project is that the hardware that we use here is extremely cheap. The NFC tags are available for prices as low as 30 cents. Another interesting aspect of our project is learning how RFID (radio frequency identification) works in conjunction with Android and how the communication between hardware and software would take place. The fact that we can help almost every section of our society through TAPP makes this project interesting and worth investing time in.

When we first started brainstorming ideas for our project, we came up with at least 5-7 different types of ideas. Some of these were pure software-based ideas such as games while some involved complex hardware which was out of scope for 4th-year Computer Engineering students. After carefully considering all possible advantages, risks, problems and disadvantages associated with each idea, we chose this idea for our project. The main reasons why we chose this idea was that since the hardware is cheap, it is easily replaceable if it gets damaged and is scalable. The scope of the use cases of this idea and project is unlimited. One could literally do whatever they want using this idea. For example, on a large scale, restaurants can place these NFC tags on each table and every time you TAPP, you get to see the whole menu of the restaurant right at your fingertips. However, this idea can be expanded to help the old aged seniors who are not technologically literate as well. TAPP can also serve as a rapid response system to help with disaster recovery mechanisms.

This project makes sense in a mobile form factor due to a variety of reasons. Firstly, these days, almost all smartphones have NFC chips incorporated right into their circuitry by the manufacturer. This makes our application usable right away for everyone. Secondly, since mobile phones are small and handy as compared to tablets, it is easier to TAPP them on to an NFC tag rather than a huge tablet.

1. Functional Properties:

1.1. Registration
The application should allow for an intuitive registration process for each NFC tag. The application should allow users to register any number of NFC tags and further be able to distinguish between two NFC tags registered by the user.

1.2. Display current NFCs
The application should display a list of active and currently registered NFC tags to the user, allowing users to be able to see the number of active NFC tags, with their respective locations.

1.3. Display tasks under each NFC
The application should display a list of tasks that would be triggered when the NFC is tapped against.

1.4. Update triggered tasks
The application should allow users to update the triggered tasks. The user should be able to delete a task and add a new task to an already registered NFC tag.

1.5. NFC Protocol
The application should be able to establish a connection with a registered NFC tag via the NFC protocol, ensuring the capability to read and write data from the application to the registered NFC tag.

1.6. Notification
The application should show a notification with information when the user executes a specific task on the application.

1.7. Unregistration
The application should allow users to unregister NFC tags and also mark certain registered NFC tags as inactive. If the user wishes to opt out of the service, he/she should successfully be able to remove the registered NFC tag from the application and further use the same NFC tag for other purposes.

2. Non-Functional Properties:

2.1. Responsive
Nowadays, over 170+ mobile devices have NFC tags. However, there are over 15 different screen sizes. Therefore, the application must be a responsive application, so it can be suitable for 4.3 – 7.0"screen and capable for 720p – 4k resolution.

2.2. Security
The application should be secure. Unauthorized users should not be able to gain access to the registered NFC tags thereby triggering a malicious activity that could further compromise the security of the application and that of the user's personal information.

2.3. Performance

The application should have a high performance in terms of the speed at which the corresponding tasks are performed. NFC, in general, has a high rate of data transfer, so that should always be a plus. However, the app should not crash while performing an action such as switching on an electrical button as that could trigger a short circuit and cause unnecessary chaos.

2.4. Dependability

The application should be reliable and perform actions exactly as intended by the user.

2.5. Compatibility

The application should be compatible with various versions of Android from Android 4.0 to Android Q.

3. Use Cases:

3.1.

Before studying, a person needs to create a perfect environment for themselves so that they would be able to concentrate. This may include things like turning the volume to a certain percentage and turning on their favorite Spotify playlist, turning off notifications, turning down the lights, etc. These settings could all be quickly set through TAPP and save the user a lot of time. This is in conjunction with the functional requirements numbered 1.1 and 1.2.

3.2.

When going to bed, a user often needs to set a variety of different settings in their phone. This can include adding an alarm for a certain time, raising their alarm volume to 100%, turning off Wi-Fi (to not be woken up by notifications), etc. Tapping a quick NFC tag with TAPP could make this process faster and less prone to mistakes from being in a drowsy state.

3.3.

When you run out of cereal (or any other product you use daily), you might forget to buy it again or add it to the things you do. It's very disappointing when you don't have cereal for your morning. Rather than that, a quick TAPP on an NFC sticker where you keep your cereal could add this product to your TODO list, or order it directly from Amazon to be shipped.

4.   **Mockups**
The images below are sample mockups for the app.
The first image shows what TAPP does when you tap on an NFC. The second image is a splash screen. The third image is the home screen. 4th and 5th image are examples of changing the settings for an NFC tag.