Exploring the interactive toy design of relationships between kids and parents: Wake Up Teddy Project

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Abstract

In this pictorial we present a prototype of a novel interactive Teddy bear that provides light feedback for press and has a connection with Bluetooth of the mobile application. Unlike existing interactive toys concerned with light or sound feedback, our aim was to design a toy that would allow the connection between kids and parents remotely. Utilizing the double diamond method enabled us to design an interactive Teddy bear that offers engagement experience for kids and parents. We offer a reflective analysis of how our user-centered approach enabled us to design.

Author Keywords
Social Interaction; Fidget; Kids; Toy; Teddy Bear.

Introduction
Children are always playing to learn about the world and explore the unknown. In this process, toys are an indispensable aid and an inseparable part of their happy childhood.

Toy is the bridge between children and the outside world. Through the process of play, not only can it help children discover themselves and explore problems, it also satisfies their innate curiosity and gives them the opportunity to express their own views and attitudes

about things. Cuddling teddy bears "evokes a sense of peace, security and comfort," psychologist Corrine Sweet said in a 2010 press release. [1]"It's human nature to crave these feelings from childhood to adult life." With this strong bonding with teddy bears, they learn new things like how to care and especially how to socialize so that a child can start becoming a socializing person. On the other hand, a child feels comfortable by fidgeting and touching a teddy bear. It offers a kid with companionship, comfort, friendship and more that can enhance a kid's growth in a better way. Thus, we made a Teddy bear to enhance such a feeling, especially for young kids. Since they have more demand in being accompanied by their parents. The physical interaction-based teddy bear we made that will be used by kids to connect their parents remotely.

Related work

There are many existing products on the market, like Curious Bear Interactive Plush Toy from Toys R Us. Cute Mini Teddy Bear Small Table alarm clock from Amazon. Although some of them embodied sound, light features, they didn’t create the connection between kids and parents.

Provocative Awareness, proposed by Bill Gaver, trying to explore new sensory and interaction design opportunities to increase engagement, and researched the extensions of awareness technologies to new domains. [2] The research from the MIT media lab found a new form of interpersonal communication through touch that opens a channel for physical expression over distance, by using Force-feedback technology is employed to create the illusion that people, separated by distance, are interacting with a shared physical object. [3] Those two insightful research papers gave us inspiration and we came up with our new idea, creating a form to connect kids and parents through the teddy bear.

Concept Description

We are making a Teddy bear that will be used by kids to connect their parents remotely, for example: parents from the office can light up the teddy bear to wake up their sleeping kids at home. The product will send feedback to parents to show children’s mood when children are fidgeting with it.

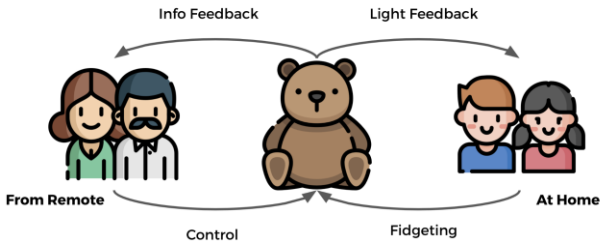

Figure 1. Social Interaction

Project process

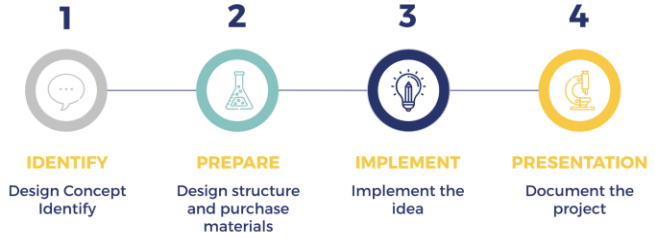

Figure 2. Project process

1. Identify

Figure 1 shows a button that could potentially replace the phone at a later stage.

Figure 3. Sketches

In the design and sketch process we tried to play with the idea of making the remote interaction simple. The picture below shows the first idea we had when we started. Our focus was set on making the app social and inspired by other social platforms.

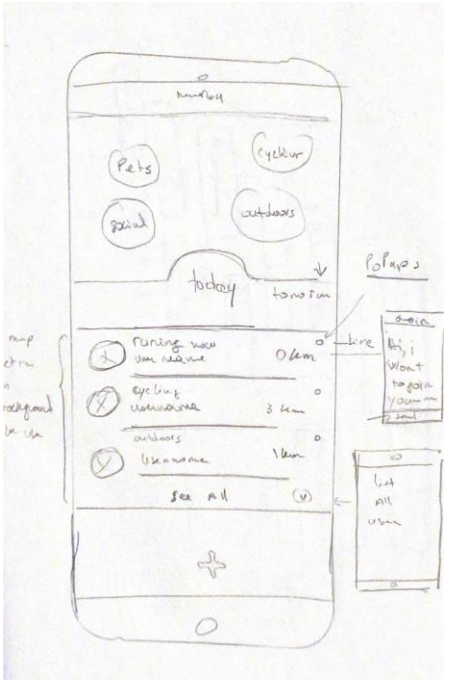

Figure 4. Sketches

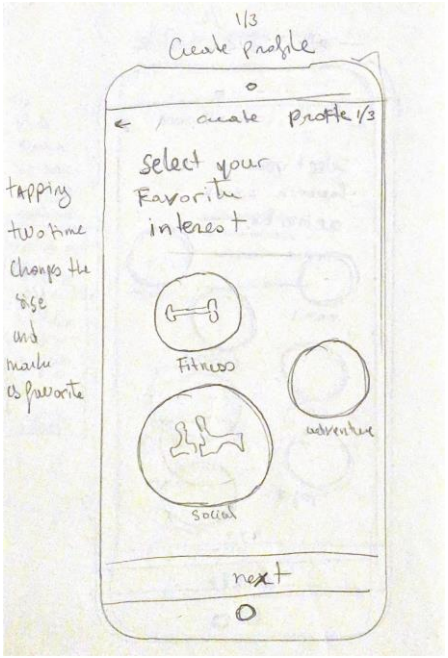

Figure 5. Sketches

During the design phase and feedback loop we then realize that the project we had in hand wasn't about making a social platform instead a fidgeting focus interaction. We went brainstorming on different ways of keeping the initial idea and at the same time explored the possibilities around the app.

The idea with the opted design below gives us an idea of the direction to take the design and interaction should be simple and clear. The first thing the user does is to connect to the fidget device by selecting the name of the fidget, the connection is done through Wi-Fi and Bluetooth. After doing that the main view allows the user to interact and send signal to the fidget

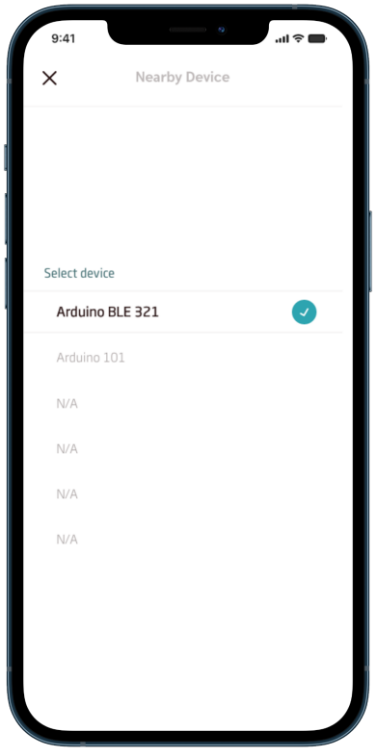

Figure 6. Mobile Prototype

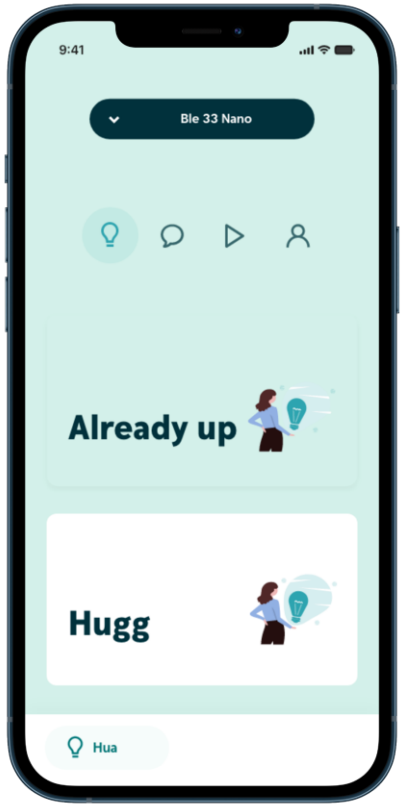

Figure 7. Mobile Prototype

Pressing the wake-up button will light up the Teddy bear. Another interaction we are exploring is what happens when the kids interact with the teddy bear. Can they remotely send signals to the phone as well? So we are also looking at ways of replicating that same experience back to the phone.

2. Prepare

The team first decided to do a social interaction between the elderly and their caretakers. Over time the feedback we got pointed us in a different direction, so we decided to do an interaction between kids and parents. We first researched the methods available to connect an Arduino over Wi-Fi to a cell phone so the kids could interact from any distance through a teddy bear that would contain an Arduino device.

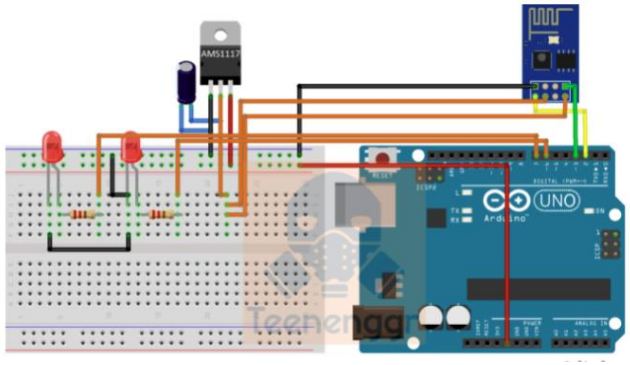

Figure 8. Wi-Fi Schematics [4]

For this example, we used an Arduino uno and one Wi-Fi component from the lab, did the wiring uploaded the sketch, the LEDs were turned on but we could not connect through Wi-Fi to the cell phone. [Figure 8]

For the second attempt we bought an Arduino Bluno nano that connects through Bluetooth to a cell phone and allows the user to control the pins from a mobile app. [Figure 9,10]

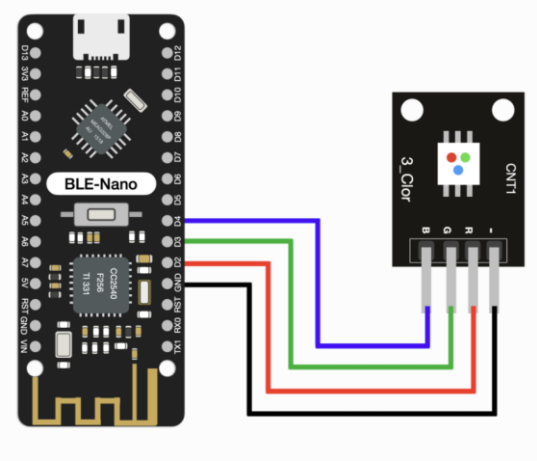

Figure 9. Bluetooth Schematics [5]

Once again, we failed to control the pins from the cellphone, we were able to find the Arduino in the Bluetooth devices from the cell phone and connect but we could not control the pins.

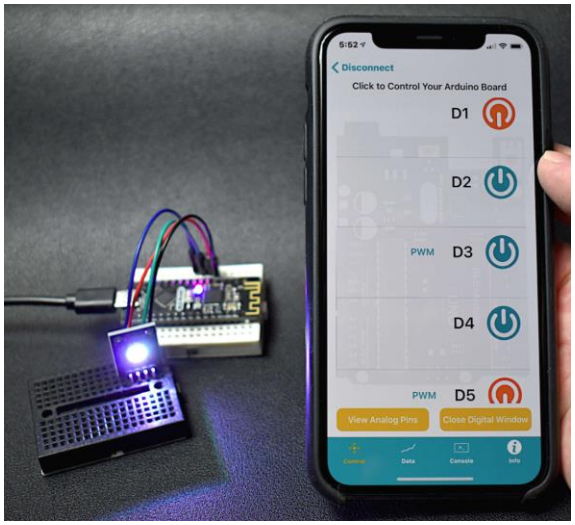

Figure 10.Mobile app [5]

For the third attempt we bought the Bluno BLE nano board and tried to connect it through the same example as in the second attempt.

3. Implement(TO-DO daniela)

For the implementation phase we had to do the coding of the app ourselves because none of the examples we found on the internet worked out of the box.

In order to connect to the teddy´s Arduino board we had to find out which reference of the Arduino we had. After we understood the reference, we found the code to connect to that Arduino reference and debugged it an entire day until we got it working.

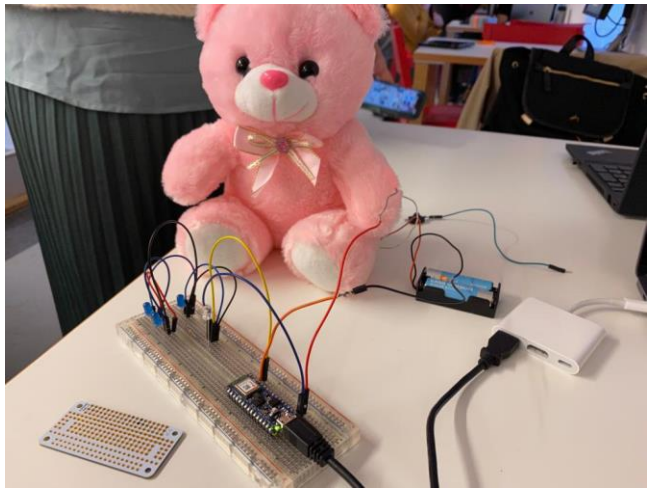

Figure 11. Teddy bear working with Bluetooth

In the coding part we first discover the Arduino through Bluetooth connection, later we listen for inputs from the mobile app, if a 0 is inserted the LEDs are turned off, if a number greater than 0 is inserted the LEDs are turned on.

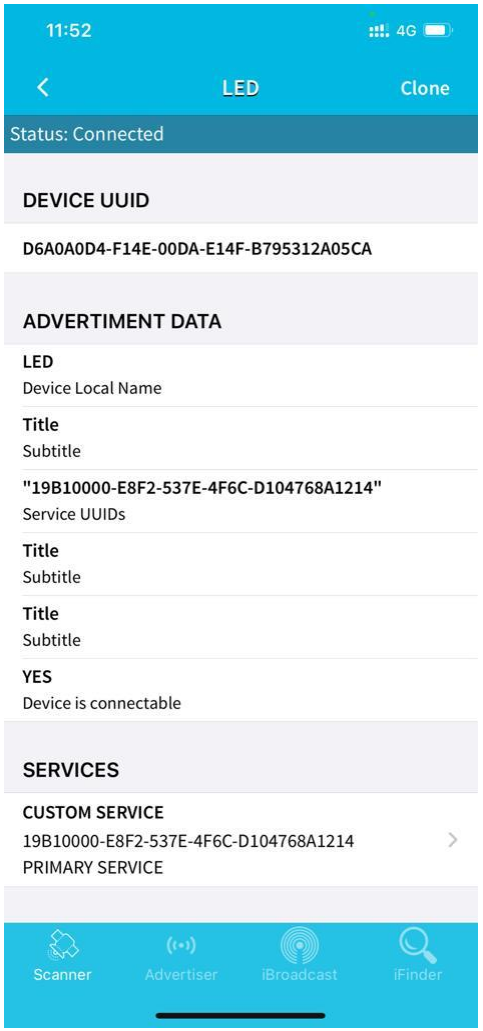

Figure 12. Mobile app to connect through bluetooth

```
// UUID for Teddy discovery
BLEService ledService("19B10000-E8F2-537E-4F6C-D104768A1214"); // BLE LED Service
// BLE LED Switch Characteristic - custom 128-bit UUID, read and writable by central
BLEByteCharacteristic switchCharacteristic("u", BLERead | BLEWrite);
const int ledPin = LED_BUILTIN; // pin to use for the LED

void setup() {
  Serial.begin(9600);
  while (!Serial);

  // set LED pin to output mode
  pinMode(ledPin, OUTPUT);

  // begin initialization
  if (!BLE.begin()) {
    Serial.println("starting BLE failed!");

    while (1);
  }
  // set advertised local name and service UUID:
  BLE.setLocalName("LED");
  BLE.setAdvertisedService(ledService);

  // add the characteristic to the service
  ledService.addCharacteristic(switchCharacteristic);

  // add service
  BLE.addService(ledService);

  // set the initial value for the characeristic:
  switchCharacteristic.writeValue(0);

  // start advertising
  BLE.advertise();
  Serial.println("BLE LED Peripheral");
}

void loop() {
  // listen for BLE peripherals to connect:
  BLEDevice central = BLE.central();

  // if a central is connected to peripheral:
  if (central) {
    Serial.print("Connected to central: ");
    // print the central's MAC address:
    Serial.println(central.address());

    // while the central is still connected to peripheral:
    while (central.connected()) {
      // if the remote device wrote to the characteristic,
      // use the value to control the LED:
      if (switchCharacteristic.written()) {
        int val = switchCharacteristic.value();
        Serial.println(val);
        if (val>0) {   // any value other than 0
          Serial.println("LED on");
          digitalWrite(ledPin, LOW);         // will turn the LED on
        } else {
          Serial.println(F("LED off"));
          digitalWrite(ledPin, HIGH);          // will turn the LED off
                                               // a 0 value
        }
      }
    }

    // when the central disconnects, print it out:
    Serial.print(F("Disconnected from central: "));
    Serial.println(central.address());
```

Figure 13. Code working with Bluetooth

4. Presentation(TO-DO hua hua)

On the demo session day, we brought the teddy bear to D33 classroom to share with other students what we have done in these weeks. We placed the teddy bear on the table, accompanied with the mobile application demo. Due to the time limitation, we didn't finish the Bluetooth connection function now. So, we show the fidget interaction within the teddy bear and how the application will work in the future. Participants fidgeting and pressing the bear and the bear lights up as the feedback. Most participants love the design because it is cute and attractive to kids. They also tried to play around with our application, and they found it was intuitive and easy to use.

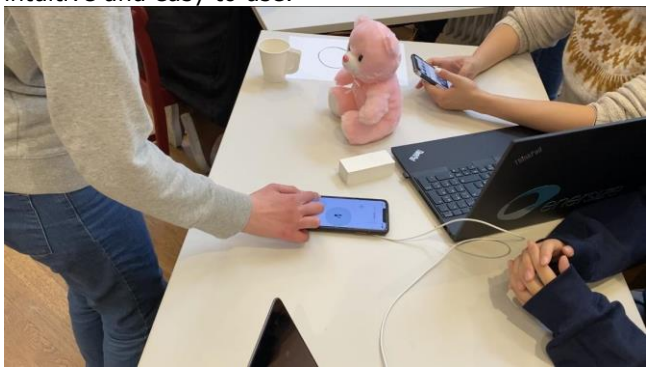

Figure 14. Demo Session

Figure 15.Participant in Demo Session

After the demo session, the teacher suggested that we complete the Bluetooth function to make our project more complete. So, we gathered together and tried many times and finally got the Bluetooth connection working, like what we proposed in our design plan. Parents can connect to the teddy bear with their phone Bluetooth and light up the bear to wake up their children.

Few of the identified risk

Addicted to the teddy bear, cry when light stops working, LED lifecycle.

Problematic if parent isn't tech savvy, connectivity could be annoying

Responsible design

Considering the responsible design part, we try to make it safe by ramping up all electronic components into a small box. In this way we can keep the components themselves safe, but also keep young children safe by keeping them away from the electronic part. What's more, the teddy bear is washable because the electronic box can be removed. So that on some level our product is recycled, we can remove the box and put it into another plush toy. Also, the materials of the teddy bear are skin-friendly, which can bring a joyful sensory experience to children.

Figure 16.Responisble design

Conclusions

The biggest challenge we had was to establish a connection between the Arduino and the phone through Wi-Fi and Bluetooth connection. We were able to solve the problem and establish a connection to the teddy bear via the phone. Solving that problem is the highlight of our project. Being able to communicate with the Arduino through Bluetooth opens a lot of opportunities both in terms of exploration and discovering new capabilities that could be added to the Teddy.

For parents to use their phone to interact with their kids through the teddy is not a fidgeting activity since it is conscious. For this project, we focused on connectivity and limited fidgeting between the kids and the teddy.

There are many other capabilities that could be added to the teddy bear to make the fidgeting more advanced such as adding a touch and pressure sensor, vibration, and sound based on how the kid fidget.

Analysis/discussion

We followed the methods of Six Thinking Hats, which has been proposed in the ideation workshop to make our idea more focused and improve the idea process and improve communication then speed up decision making. We feel the advantages of this method since we made our first decision only using 20 mins. But then the teacher gave us feedback that our first idea was not as reliable as we thought. The reasons are we didn't stand in the user's shoes and didn't have well-reached research. So, we turned to the field we are familiar with, which is kids and parents. This time we came up with the idea of the teddy bear more solidly and meaningfully. During these activities, we found that although design methods can accelerate the design process, we still need to fully understand the situation. The methods can be a helpful tool but cannot be the alternative for research and careful deliberations.

For the future, adding new capabilities and fidget friendly interaction will add value to current work such as:

1. Sensor,
2. Musical functions,
3. Roll in the rhythm, swing, sing and speak,
4. Interactive functions, respond to gestures

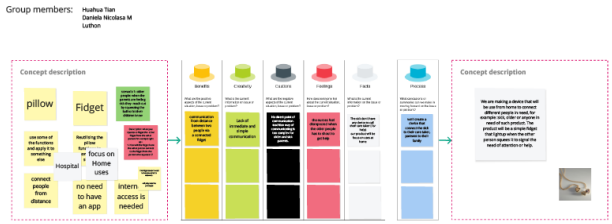

Figure 17. Six Thinking Hats Methods

The team used the double diamond framework for the implementation of the fidget toy, discover, define, develop and deliver are the different stages that the team went through to come up with the result. [6]

The design principles

The design principles put into action during this course are listed below.

- **Put people first:** The team started by conducting interviews to parents and their children to understand their needs.
- **Communicate visually and inclusively:** The team strived to create visual aids like videos to explain the idea and the concept design.
- **Collaborate and co-create:** The team worked collaboratively, and they made sure everyone did their part.
- **Iterate, iterate, iterate:** Every step of the way was a new iteration in the process.

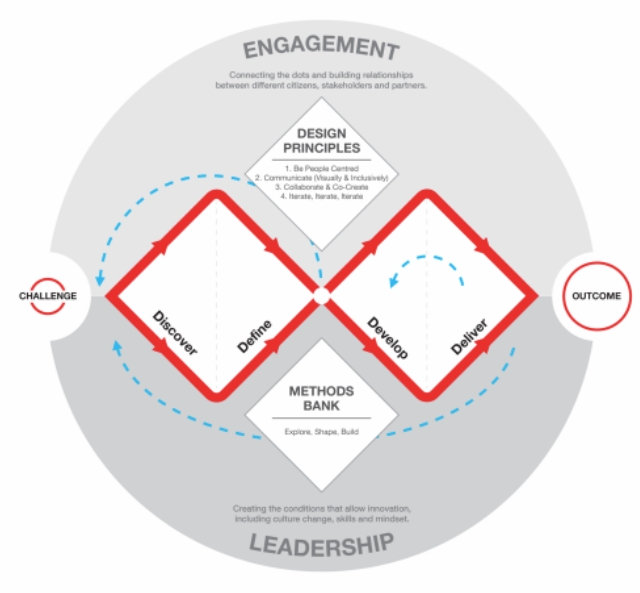

Figure 18 Double diamond framework [6]

References

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