happybot

HAPPYTEAM – HAPPYBOT

...make you smile!

MALE ADULTS

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ABSTRACT

Happybot is your friend, who has but one motivation – to make you smile. It is able to read your emotion, display images and videos, play music, dance and recognize your reaction to learn what you like.

If you're happy, Happybot is happy.

Creative
Challenge
\2016

"U mad bro?"

## CONTENTS

1. Introduction

a. Background

Let's create something that helps us with our problems – in a fun way.

This is a project undertaken as a part of the course How to Make a Robot with Artificial Intelligence at Seoul National University, as well as a contribution to the 2016 SK Creative Challenge. The primary focus for our team is to create a robot or toy aimed at young adults (adults below middle age), which aims to solve a problem this group faces. Our team consists of six members: two mechanical engineers, two software engineers, a designer, and a marketer. These roles perform separate tasks to complete the final prototype.

b. Problem
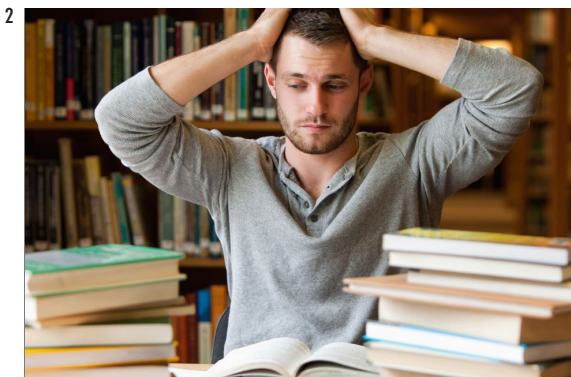
Problem Definition

When looking at the issues of our focus group, both university students and young adults in general, stress came up as a frequent problem. Chronic stress can be caused by a high workload, major life changes and many other factors. It affects mental and physical health negatively, and by extension decreases overall life quality. In our research, smiling was reported to decrease negative effects of stress. By helping young adults combat damaging stress by making them smile more, we could potentially help them increase overall life quality. Even fake smiling can make us happier by initiating a sensory feedback loop to the brain, triggering the emotions normally associated with a smile.

Additionally to the increasing amount of stress for students and adults in general, it is easier now, more than ever, thanks to the internet, to access distractive media. Humans are seeking out fast rewards, that is why especially young adult males spend so much time on the internet; there is videos, images and music instantly at your fingertips, often resulting in bad time management, and finally leading to even more stress.

With Happybot we wanted to create a product that makes our users happier, by making them smile, and makes them more mindful in seeking out distractions, ultimately reducing stress and increasing life quality.

1. http://www.genengnews.com/media/images/genhighlight/Sept18_2014_36138908_DepressedMan_BloodTestForDepression3457134149.jpg
2. http://www.dekalbeducationfoundation.com/wp-content/uploads/2016/10/Ameritech-Financial-Review-1080x641.jpg
3. http://assets2.bigthink.com/system/idea_thumbnails/55876/primary/attention_span.jpg?1406237612

1. Introduction

c. Process
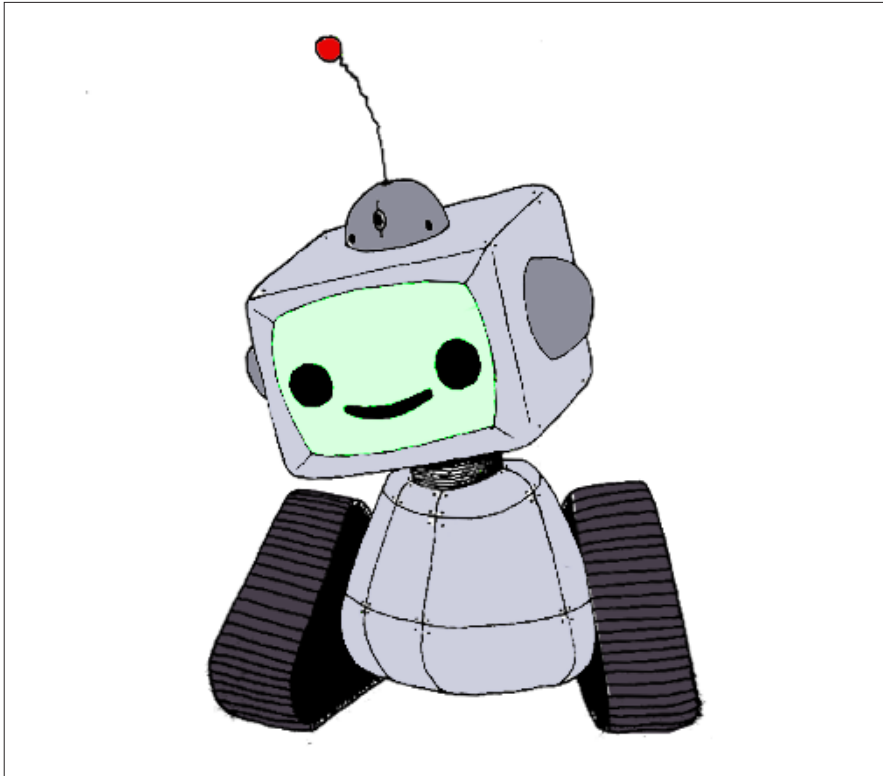
The development process followed the engineering design methodology, a pre-defined set of incremental steps aimed to maintain a strong focus on customer requirements and constraints throughout the product development.

The first few weeks were spent on market research, and consisted of a combination of desk research and conducted surveys. Problems were defined, and brainstorming sessions were held to come up with possible solutions to these problems. From this, a set of requirements was defined.

Our designer and mechanical engineers came up with different design suggestions for a functional product, and the team selected the design which was judged to best suit the requirements while being achievablen considering the constraints. A simple prototype was made of the conceptual design.

After getting feedback on our work, the functional requirements were updated and the conceptual design revisited. The new design was then implemented as a prototype.

2. Research

a. Target

Our market research was done in three parts. For the first part, or focus was on young adults between the ages of 18–30. For the second part, we focused on students. For the third part, we conducted some extra research to test the viability of the project idea we based on our previously conducted research.

a.1. Young Adults

Young adults are often either still studying with the purpose of starting their future careers, or already employed. There is quite a lot of pressure on people in this age to work hard and advance in their career. In the younger age bracket, getting used to new responsibilities in a new social setting is also a major part of life.

Issues and solutions

– Stress: Stress is the way our brain responds to any demand. In both academic life and in most work places, there are deadlines which must be met. In addition to this, many people in this age group go through fundamental changes in their life situations, such as moving into new homes or settling into a new social role. Stress can be positive, but if it becomes constant it can cause a number of negative health effects. Some examples of this are headaches, depressed mood, and sleeplessness (https://www.nimh.nih.gov/health/publications/stress/index.shtml) – all of which could have a negative impact on studies and work. According to statistics from the US, job pressure is the number one cause of stress, and nearly half of the population says stress has a negative impact on their personal and professional life. (http://www.statisticbrain.com/stress-statistics/)
A simple and perhaps surprising way to deal with stress, which has proven to be effective, is smiling. (https://kuscholarworks.ku.edu/bitstream/handle/1808/7903/Kraft_ku_0099M_11340_DATA_1.pdf) In the cited study, individuals who activated the muscles involved in a smile during a stressful task reported lower negative effects compared to the control group. In a survey we conducted among our age group of interest, more than 25% of people reported that they rarely smile.

How often do you smile daily?

- I rarely smile
- I sometimes smile
- I smile a lot
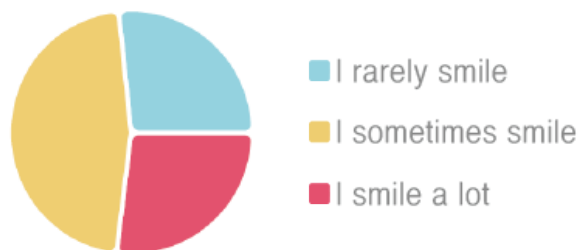
– Lack of physical activity: A sedentary lifestyle is common in developed countries. Imagine a typical university student studying for an exam (or writing this book), or a worker with a desk job: Each day, the person spends hours sitting down. Work is mentally challenging, or maybe boring. When it's time to go home, perhaps the person takes the bus (got a seat! Lucky!). Mentally exhausted after the day, they proceed to surf the web, play a video game or perhaps watch a drama after coming home. Even if our hypothetical person is actually pretty health conscious and makes sure to get some physical activity into their schedule (walking instead of taking the bus, visiting the gym in the mornings), prolonged sitting has negative health effects. In a statistical study comparing sitting times with mortality rates from all causes, there was "a significant difference in survival probability across categories of daily sitting time," where people who spent "almost all of the time" sitting had a significantly higher death rate than the ones spending "almost none of the time" sitting.
(http://revdesportiva.pt/files/form_cont/Sitting_Time_and_Mortality_from_All_Causes.pdf) In a survey we conducted, nearly 70% reported that they spend more than 9 hours per day seated.

If a person were to take occasional breaks for short walks, this would instead have a positive impact on health and work. For tasks requiring creative thinking, walking (outside or inside) has been shown to have a positive impact on creative cognitive ability.
(http://news.stanford.edu/2014/04/24/walking-vs-sitting-042414/).

2. Research

a.2. Students

In this section, we mainly focused on university students.

Challenges

— New Responsibilities and New Social Structure: Students, especially in moving from high school to a university setting, face several new responsibilities. There is often an increased workload, with higher expectations on the student to manage and plan their own time in such a way that they can work through it all. In addition, many students move away from home during this time to live in a dormitory or a student apartment closer to university. This means being responsible for selfcare as well, whether it means doing laundry and making sure to stay reasonably clean or just making sure to get a couple of semi-healthy meals daily.
Social life is also important, and many people spend a significant time at university socialising and making new friends. In many cases, the student find themselves surrounded by a wide variety of people from different backgrounds, in different age groups. Some might be older and have more life experience, and others might be from a completely different culture.

— Uncertainty and Dealing with Failure: University studies are most frequently undertaken with the intention of starting a specific career afterwards. This means that the stakes might be high, as a student's future is being decided. The effort put into tests come with a great deal of uncertainty about future gains, income, and consequences of failure. Dealing with failure is not easy, and yet it is something most students must learn.

Risks

With the many challenges students face, it is not uncommon to engage in unhealthy behaviours to deal with stress, fit into the social norm, or to attempt to achieve higher academic results. Binge drinking is a common problem among university students (https://www.niaaa.nih.gov/alcoholhealth/special-populations-co-occurring-disorders/college-drinking), and there's also a risk of developing unhealthy eating habits (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3905922/). In recent years, so called "smart drugs" aimed to improve academic performance are increasing in popularity, and these could have a number of negative side effects. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4462043/)

Needs	Gadgets in use
x Focus	x Smartphone, laptop, tablet
x Self-discipline	x Smartwatch
x Structure	x USB
x Balance between work and free time	x Alarm clock
	x Smartpen

a.3. Project Idea Viability

Following our idea of showing media to make someone smile, we needed to know if it would work. Is this already a common method for people to improve their mood? We conducted an online survey in which people answered if they consume media with this purpose, and questions related to the frequency and type of media consumed.

What kind of media do you consume to feel better?

Videogames | Books | Pictures | GIFs | Video | Music

Every person in our relevant age bracket responded that they do consume media as an attempt to cheer themselves up. 84% watch videos, and 32% look at gifs. The three most common keywords associated with the kind of media people watch to cheer themselves up is "funny" (66%), "comedy" (61%) and "cute" (48%).

Which words do you associate with this kind of media?

Other | Uplifting | Beautiful | Comedy | Funny | Cute

2. Research

b. Design

For the design researched we first thought about what kind of toys, technology and robots young adults came up with to be able to create something our target audience easily associates with since it looks familiar and then looked at the current state of art.

Previously Owned Toys

1. https://s-media-cache-ak0.pinimg.com/originals/a8/ec/fb/a8ecfb2b294d0e412ab22267c3c8ebf2.jpg
2. https://images.kurier.at/13222340020268.jpg/620x930nocrop/569,682
3. http://vignette4.wikia.nocookie.net/mario/images/b/bb/GameBoy.jpg/revision/latest?cb=20080614123406&path-prefix=de
4. http://images.complex.com/complex/image/upload/c_limit,w_680/f_auto,fl_lossy,pg_1,q_auto/m7gidtaa8fmq8mkzgz5q.jpg
5. http://images.complex.com/complex/image/upload/c_limit,w_680/f_auto,fl_lossy,pg_1,q_auto/inzrwqlfoqh2xec2rymd.jpg
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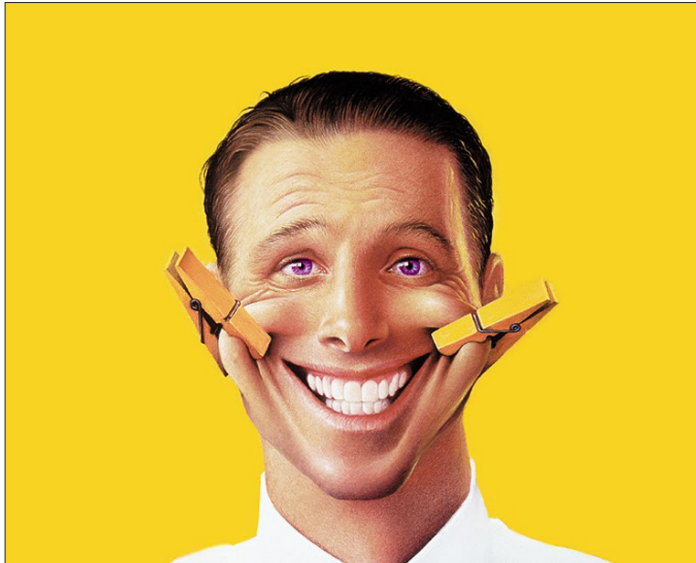
c. Technology

Current Companion Robots

1. https://images-na.ssl-images-amazon.com/images/I/61BrzPaohML._SL1300_.jpg

2. http://cdn3.volusion.com/lfeyd.rgtbe/v/vspfiles/photos/RTNAOH21-2.jpg?1348762188

3. http://cdn.thegadgetflow.com/wp-content/uploads/2015/07/BUDDY-06.jpg

4. https://s3-ap-northeast-1.amazonaws.com/www.rentio.jp/images/products/636f168fa400e536452e424ba35f71cbf23e94f6/large.png?1475033453

5. http://thenextweb.com/wp-content/blogs.dir/1/files/2014/06/pepper.jpg

6. http://upmann.digital/wp-content/uploads/2016/10/53855-toyota-prasentiert-sprechenden-begleiter-fur-haus-und-auto-20161003-02-09.jpg
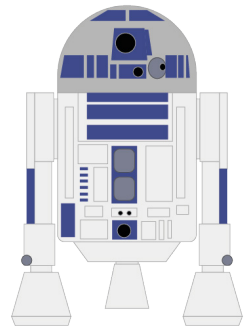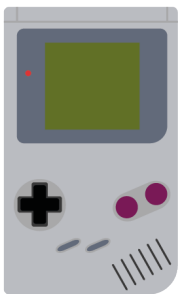
3. Ideation

a. Metaphor

Happybots goal is to make so smile – no matter what. He doesn't care if you really smile or fake it, because your body doesn't care either. The effects are the same, so he is not afraid to even force you to. It's for your own happiness! So the metaphor we are using for Happybot is: make you smile.

b. Brainstorming

These three objects are the base of our design. The Nintendo Game Boy was our first handheld videogame console, Happybot is our first robot with artificial intelligence. He's your first robotic friend, just like the Tamagotchi was your first digital pet and he is just as expressive and curious as R2D2.

1. http://www.personal.psu.edu/afr3/blogs/siowfa13/fake-smile.jpg
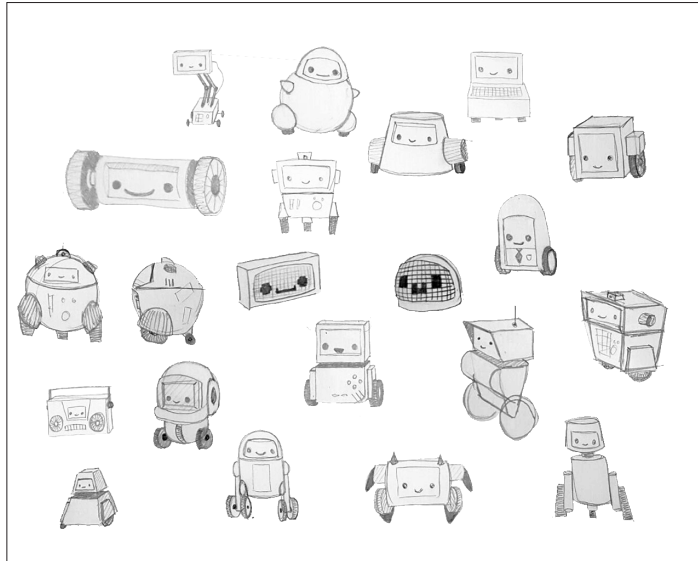
These first sketches illustrate already which direction we want to go with Happybot. He's supposed to be cute, his form geometric and incooperate some key features like a display for his face and wheels to move around.

c. Insight

Haengbot should provide the user with fun while awakening feelings of nostalgia and emotional attachment.

4. Concept

a. Objective

Our objective is to create a product which makes the user smile. This core objective rests upon several smaller objectives:

- Create a visually pleasing design. The design should be cute, but simple. The robot's design needs to get approval from adult users. This objective will be considered met if 80% of asked potential users approve of the conceptual design.
- Emotion detection. This is crucial to enable to robot to measure emotional response. The robot should be able to accurately detect a smile, or the absence of a smile, 80% of the time.
- Show "high quality" media, i.e. media the user reacts well to. The objective will be considered fulfilled if the robot's attempts to make the user smile have been successful more than 10 out of 20 times.

b. Strategy

Individual responsibility

Since the objectives need to be fulfilled within a short period of time, the team is dividing the work among its members according to their respective role. Our designer's main focus is on the physical and digital design, the mechanical engineers build the prototype and make sure the design is functional, and the software engineers are responsible for implementation and integration of the software. The marketer, due to also being a software engineer, is involved in the software side as well as the documentation and integration of the project's respective parts into one product.

Design

Our designer carries the responsibility of implementing the design, in cooperation with the mechanical engineers to ensure that it remains functional. Throughout the design process, frequent feedback is received to help us fulfil our objective. The visual look of the product is not only dependant on the physical form, but also on what is shown on the screen. To make the product appealing for a wider variety of people, the digital appearance (and part of the physical appearance) is customizable.

Emotion detection

Our product uses visual cues to detect emotion, and relies on the presence (or absence) of a smile. Due to the time constraint, we use third party software and a pre-existing API for face detection and facial expression analysis. The software engineers create the interface to integrate these tools with a camera, and implement "happiness detection" into our software.

Predict user response

Like emotion detection, the selection of media to show is done on a software level. The robot will use deep learning to base the choice of which media to display on how the user has previously responded to the same media category. Because of the time constraint, the prototype will only have four distinct media categories, and the media will be located internally.

c. Key Feature

Haengbot reads the user's facial expressions and, if the user is not smiling, attempts to cheer the user up by displaying a gif. The decision of which gif Haengbot shows is based on the user's past reactions. Haengbot will remember if the attempt was successful or not, and the media category which has been more successful at making the user smile in the past will be more likely to show in the future. In addition to displaying media, Haengbot makes use of movement and sound to entertain the user.

We don't laugh because we're happy we're happy because we laugh.

– William James

5. User Analysis

a. Persona

To further illustrate, who our target audience is we created this persona:

Christopher Hamilton

| Hardworking | Friendly | Smart | Daydreamer |

Bio

Christopher studies business and economics at graduate level. He often feels like he spends the better part of the day at his desk, attempting to cram as much information as possible into his memory without succeeding as well as he would like.

In other words, he doesn't think he's as effective as he could be. This causes him some stress and tension, especially before a deadline or exam. Chris sometimes deals with too much stress by giving up, which makes the hours he could have spent with his friends seem wasted.

Age: 26
Gender: Male
Work: Student
Location: Seoul

Frustrations

- Frequent inability to focus
- Little time to hang out with friends
- Feeling of achieving less from his studies than he's capable of

Goals

- Achieve better results as a student
- Better time management
- Improve mood

6. Design

a. Product

The first design of Happybot was largely based on the 1989 original Nintendo Game Boy. Many of us grew up playing with this handheld console and have it in good memory. Its rectangular shape shows robustness, the buttons are reminiscent of the time before the now omnipresent touch displays. In the top part is a high defnition webcam, used to capture image of the user to determine their emotional status. The display in the middle shows both the robots face as well as different kinds of media. Happybot is supported by two big wheels that allow him to move on its own, the third smaller wheel in the front, helps stabilizing and can be extended to make the robot look upward.

The updated design features a rounder and smaller version of Happybot. It is less bulky, supports less buttons and the battery pack, that was previously on the back of Happybot, now is inside the chassis. Additionally, we were able to implement user customizability. Holes on the top of the robot allow the user to plug in different kinds of headgear, be it hair, a hat or ears and corresponding downloadable skins for the face and body.

b. Logo

In the early stage of development our robots name was "행봇", a play on words based on the Korean "행복"(happiness) and "로봇"(robot). To make it easier to understand for the international market we decided to change it to "Happybot".
It features a stylized front view of the robot as the icon and a uniquely made word mark.

c. Customizability

Modern design and modern interaction with design is dominated by two things: simplicity in form and ability to customize. Whether it is your smartphone you put in a colorful phone case or if it is your laptop you freely decorate with many stickers – You decide what it looks like. You decide what story you want to tell. The same goes for Happybot. You can choose between a huge variety of different skins, from your favourite movie characters to cute animals to popular icons. You are free to customize your own happiness.
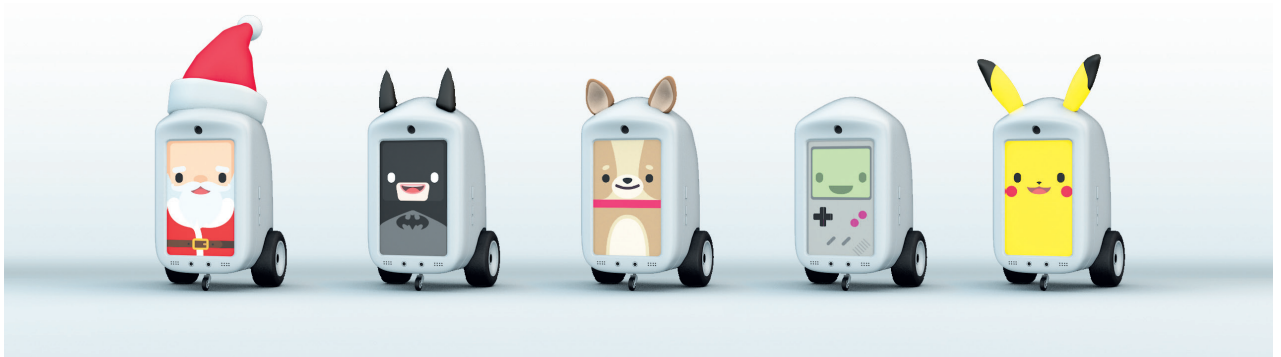
7. Implementation

a. Hardware

Based on the design we made, we derived the mechanical requirements we and our customers have on Happybot. Ideally he is lighter than 5 kg, smaller than 30 x 30 x 30 cm, similar in speed to humans walking, so around 6 km/h fast, have a battery life of more than 12 hours and be quite sturdy and durable, so nothing brakes easily.

To implement the critical functions of our concept, we decided to use this hardware:

- Raspberry Pi as our brain
- Webcam as our eye
- Two Speakers for the voice
- Two D/C and two servo motors as our muscle
- One display
- One rechargeable battery pack
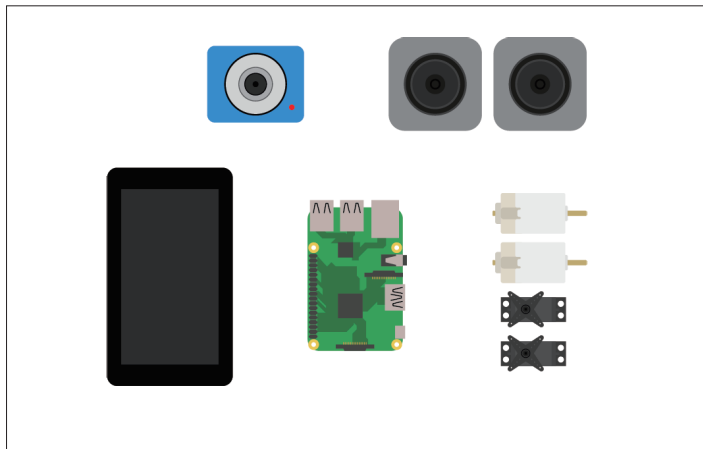
The biggest challenge mechanically was to implement the tilting function, so Happybot is actually able to rotate his body on both the x and the y-axis to look at the users face to corecctly calculate the emotional state. This was done with two extra motors that extend or retract a third wheel in the center front of Happybot.
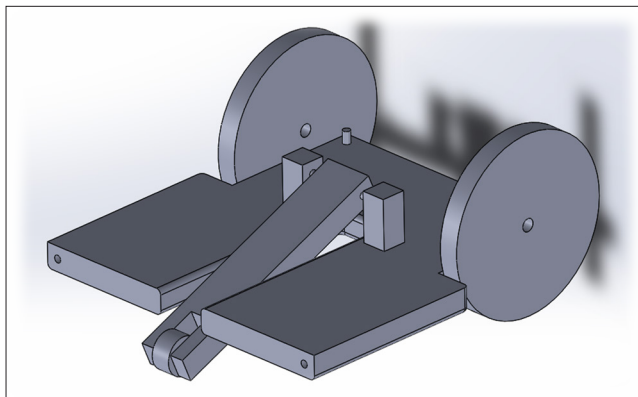
b. Software

As for the software, we are using Microsofts Emotion API which allows us to detect the users emotional state and the GIPHY API is our library of different media, especially funny gifs, accessed through a wireless internet connection by the Raspberry Pi.

These two charts illustrate in a simplified manner what happens inside Happybot, when he recognizes a face, the emotional state, shows media, waits for response and keeps track of the positive or negative reaction to build his own library of the users taste and what he or she finds funny.
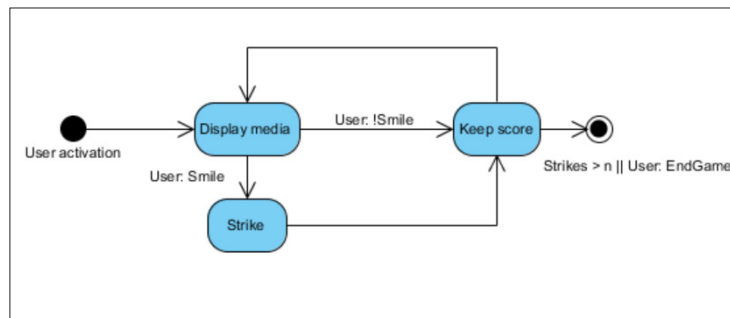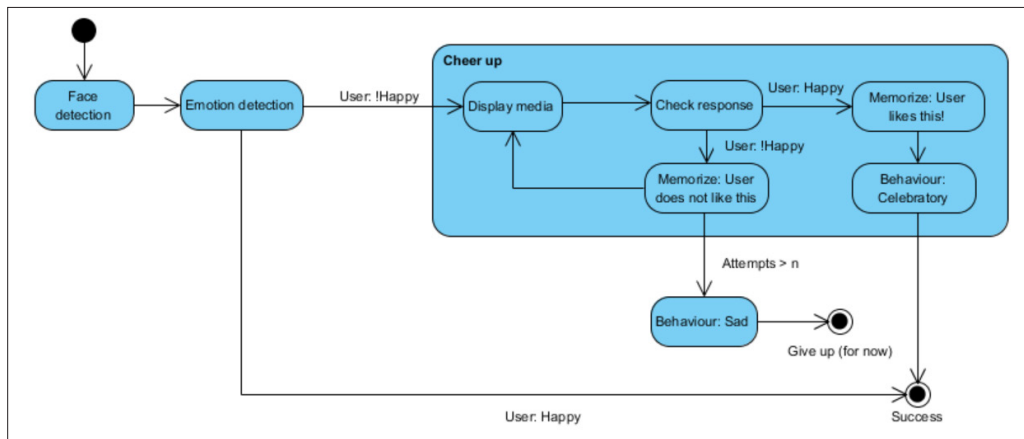
a. Episode

This comic exemplifies how Happybot actually works.

User sits in front of his work, is tired.

Happybot: Time for a break!

Happybot shows the user something that makes him laugh.

Now the user can continue on his work and be productive.

a. Business Model

Sale of Happybot

- Happybot will always stay fresh, as software updates can introduce new features and customization (new skins, voices, ⋯)
- Each sale provides a medium-size one-time revenue
- The separate cost of the components (small screen, battery, Raspberry Pi, motors) are not large, allowing us to keep the price down and make a profit

Micro transactions

- Special skins, audio, and small games can be purchased for small amounts
- Ongoing revenue, which can also lower initial purchase price

Advertising and cross-promotions

- Companies can promote their brand and products through Happybot!
- Customized skins, music, and shown media can allow companies to promote their brands on Happybots around the world
- QR codes on products can give access to special Happybot skins

b. Evaluation

The ultimate goals for this project were to create a toy/robot which is able to

1. Sense the world around it
2. Incorporate some artificial intelligence
3. Use its sensor(s) and intelligence to detect and respond to a stimulus

Happybot is a fun robot uses a camera to find the user's face and recognize facial expressions. Its artificial intelligence enables it to predict which kind of media the user will respond well to, and increase the probability of Happybot showing that kind of media when the user is not smiling. In this regard, we consider the goals to be met.

The time constraint combined with the different schedules of the team member posed a challenge to the completion of the project, especially to the integration of the separate parts. Considering this, we are proud to be able to present a working prototype of Happybot.