Project 1 Group Report: Modified Desktop Fan

By: Kevin O. Lopez Castellanos, EunKwang (David) Lee, and Anais Tepanyi

I.  *Introduction*

The goal of this group project was developed a new model for a portable desktop fan. Desktop fans these are limited by either cord-outlet connection, mechanical design constraints, motor positioning, etc. This report is to document the process that led to the final design of our modified desk fan design.

II. *Background*

On Kevin’s side of the project, he wanted to develop a fan that fully portable. To make that happen, he chose batteries as a power source. Instead of small AA or AAA batteries, Kevin wished to use Lithium-ion batteries, the same kind used in any standard android phone. He reasoned that since many common folk use android phones instead of iPhones for financial reasons, they would have android chargers that are compatible with the Lithium-ion batteries and provide a good desktop fan for the common folk.

On EunKwang’s side of the project, he believed that innovation over the

III. *Material Research*

Kevin focused on researching musical instruments and jet engines. He believed that by modeling a fan after the basic design of a Turbojet engine would allow faster fan action and thus more satisfactory cool air passing to the customer at a faster pace. He also researched musical instruments because he remembered a similar project done in an art class in high school except the design was determined by best sound emission. He
decided to apply the same principle but in travel of air. In his research, Kevin became particularly interested in the shape of a tuba.

EunKwang’s research focused primarily on wind systems that did not rely on blades to rotate air. As a result, EunKwang discovered fans that worked with air-intake sensors that would take in air and then blow it in the other direction without the use of blades. His research also followed looking the proper shape of an air-intake system and he was particularly interested in inclined surfaces.

Anais’s research was centered around the fundamental components of the fan and improvement of said components rather innovation. From her investigations, Anais focused on fans that were optimally positioned to provide maximum wind to the customer’s face.

**IV. **\textit{Design Processes}

Kevin focused his design processes on simplification. He knew simply copying the structures of a jet engine or tuba was not a smart or cost-effective way to model a desktop fan. He instead simply decided to take the basic shape of the jet engine’s and tuba’s shells and then make modifications inside that resemble the traditional fan. For instance, he chose to incorporate the motor inside the shell but by using small wires in the inner shell, he connected the fan to a motor stand on the bottom.

EunKwang’s designs focused on innovation of the air system of the fan. He primarily centered his designs on fans that did not include blades and fans that reduced the number of blades. His best designs focused on an inclined surface that would provide superior air intake into the fan.
Anais’s designs centered around modification rather than innovation. Her reasoning was that instead of investing money on new designs that have no guarantee of success, she advocated investing minimal money on a system that already works but requires modified positioning and different materials in order to develop a better desktop fan.

V. **Design Descriptions**

*EunKwang Lee*

**Design 1**: Bladeless fan.

Description:

Bladeless fan has no blade. It can blow air from a fan without blades. Blades is in the fan and hidden. The fan has air- intake equipment then blows wind to outside through tube. Inclined surface in the fan makes air diffuse efficiently.

Pros)

1. It is safer than fan with blade.
2. Consumer do not have to clean blade.
3. Material can be saved since the fan does not have blades.

Cons)

1. More energy would be consumed than previous fan.
2. Consumer have to clean filter of air-intake.
Design 2: Two blades- Fan

Description

There are blades on frond side and back side.

Pros)
1. The fan can blow air to multiple people due to blades on both sides.
2. By using two blades, the fan can make surroundings much cooler.

Cons)
1. Twice as much energy would be consumed than previous fan which has one blade
2. More material is needed to make more blades.

Kevin O. Lopez Castellanos

Design 1: Turbofan

Description:

A battery-operated desktop whose shape is modeled after a Turbofan jet engine design. The fan is made of a polycarbonate plastic casing which is strong but also light. It also contains a small Printed Circuit Board as well as the charging components for the fan

Pros)
1. Battery uses a standard Android USB charger (very cheap); battery life (min: 4 hours)
2. No need to buy extra equipment (unless you are an iPhone person)
3. More concentrated air currents to the face
4. Projected life: 10-15 years

Cons)
1. Extra money needs to be diverted to industrial and electrical engineers to handle the shape and PCB
2. More blades = more material
3. Projected cost: $55 each

Design 2: Horn Fan
Description:
A fan modeled after the shape of a tuba with 3 small blade motors positioned throughout the inside of the tube shape. The shape of the fan allows for concentrated air to spread out when it exits the fan, providing more cool air into a greater surface area of the surroundings.

Pros)
1. Battery-operated (three AAA batteries)
2. Hollow so less material is required
3. Low cost motors
4. Greater quantity of air currents
5. Projected cost: $20 each

Cons)
1. Due to types of materials used, product lifetime is projected at only 3-5 years

2. Small fans inside may require consistent cleaning

3. Low cost circuitry so it is likely to burn out or die within 3 years

Anais Tepanyi

Design 1: I motivated to design this fan to help anybody to have it.

I make sure that customers are seeing something special in our time easily. To design the first fan, I researched fans online and I started to read each one pros and cons. I wanted to know what improvement each fan has. According to studying and investigating each fan, I got an idea for the first design. I knew which kind of fan I wanted to design, a fan that has something special. Width: 5”

Price: low cost motor and it costs $25

Material: polycarbonate plastic

For this fan, you need to click one button to turn on and off. It helps to cool off a home in an easy way and improve fuel economy as the engine drag from turning the fan is eliminated.

Design 2: *Mechanical fan

Describe it:
This fan consists of a rotating arrangement of vanes or blades which act on the air.

Its rotation assembly of blades and hub is like a rotor or a runner. That is why it is easy to create a cool air in the house.

It has an electric motor like other fans but it has also solar power. Other fans can work with both solar power and electric motors.

But this fan that we designed can work either with both or with one engine (one of them.)

With this fan, customers have an option to produce air in the house with high volume and high pressure or low pressure and high volume.

The first button powers the fan, the second is there to control how you want the air flows in your house, and the last button is to turn it off.

Easy to get

It is not expensive in store.

Customers can buy it in every store at a low price.

This fan was designed for everybody to be able to purchase it. Sometimes technical issue can happen with electric fan or you want to avoid the consumption of power and mechanical fan is the best fan for you.

It is easy to care in everywhere for instance, you can carry it in your car.

Width: 7”

It costs $40

Material: polycarbonate plastic
VI. **Decision Matrix**

The following charts portray the rating each preliminary idea from each member went through to objectively determine the best idea for the final project.

**Kevin’s Decision Matrix Ratings**

*From Anais Tepanyi*

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*From EunKwang Lee*

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**Kevin’s Average Scores:** Design 1: 28, Design 2: 21.5

**EunKwang’s Average Scores:** Design 1: 25, Design 2: 21.5
Anais’s Average Scores: *Design 1*: 23, *Design 2*: 22

From the Individual Decision Matrix Ratings, the design that has been chosen the objectively best model to use is Kevin’s Fan Design #1, better known as his Turbofan design.
Preliminary Idea #1: Turbofan (Desktop Fan Modeled after Turbofan jet engine)

Outside

Pros
- Battery operated (uses standard Android)
- Use charger
- No need to buy extra equipment
- More concentrated air currents to the face

Cons
- Extra money needed to be diverted to Industrial engineers
- More blades = more material

Materials: Polycarbonate plastic, strong and light; low-cost motor; PCB

Projected cost: $55

Projected life: 10-15 years
Preliminary Idea #2: Multi-Horn Fan (Desktop Fan modeled after a horn)

Pros:
- Battery operated (3 AAA Batteries)
- Hollow so less material is required
- Low cost motors
- 3 motors & fans allows more air currents
- Shape allows concentrated air to spread out when it goes outside

Cons:
- Due to material, product lifetime not ideal
- Small fans inside may require consistent cleaning
- Low cost circuitry is likely to fail by 3 years

Projected cost: $20
Projected life: 3-5 years

Stand and switches

Hollow inside
Motors and fans (inside)

5 3/8”

7 1/8”
Bladeless Fan

tuyere (13mm)
Inclined surface
(16°)

Pros
- Softly from bladeless.
- No need to clean blade.
- No blades = save material.

Cons
- Consuming more energy than regular.
- Need to clean filter of air intake.
In both sides there are blades.
Fan which has two blades on both side

Pros:
- Multiple people can use it.
- Wireless charge
- By using two blades, fan can make cooler condition

Cons:
- Twice of energy consuming of fan which has one side
- More blades → more material
Fan I

- This electric fan is easy to use. All you need to do is click on button to power it on.
- It is small and you can put if in every area in your house.
- It is inexpensive to buy.


1. It helps to cool off a room in a easy way.
2. It helps to pull warm air out of a house. In addition, improve fuel economy as the engine drag from having the fan is eliminated.