I. Abstract

Based on “The National Institute for Occupational Safety and Health”, thirty two firefighters have died in the United States during 2019, and there is a 14% increase of getting cancer as a firefighter. Firefighters are more likely to develop respiratory, digestive, and urinary system issues than the general public due to exposure to contaminants. Our future technology vision is to make an intelligent face mask for firefighters to save others while protecting themselves. The mask will have VR and a thermal camera so you can see through the smoke. We will be able to use thermal imaging to detect where the human body is. It will also plan a way to get to the person/animal that is in trouble out of the dangerous situation.

SaveMask- Innovative Mask for Firefighters

II. Description

1. Present Technology

Today the technology for firefighter's gear is limited and out of date for the scenarios where gases and deadly fumes get inside them and end up killing them. For example, when we interviewed an actual firefighter, Lando Alvardo, he said that the seal for the mask could be tighter because of how many people have died of cancer afterward.

Firemen also use thermal imaging cameras. These are inside the face piece, the mask cannot locate where the people are. This is the same problem people had all the back when firefighting started. People make technology that maps the room but it might not map people hiding

2. History

The history of firefighter masks is very interesting mainly because of how far back the history goes. In 1824, a miner named John Roberts came up with a smoke respirator allowed humans to enter dense smoke with no danger of dying. During 1825 Giovanna Aldini made a mask that provided heat protection and fresh air. In 1863, we saw major changes to the fire mask including an improved respiring apparatus with two self-contained canvas bags as well as goggles, a leather hood, and a nose clamp. Firefighter masks are very fun to learn about because of its history.

3. Future technology

Our future technology vision is to make an intelligent face mask for firefighters to save others while protecting themselves. This face mask will use a thermal camera so you can see through the smoke and VR to assist in locating and saving people. The mask will also provide protection for the firemen by using sensors to assist if they are being exposed to contaminants or the seal of the mask is compromised. The mask will also be made of using graphene to strengthen and lighten the current mask.

Figure 1:

One technology we want to include in our project is thermal imaging. We want to be able to use AI too . We will do this by having the AI sense where the smoke is most concentrated around the firefighter, and activate an oxygen blower located inside the helmet. This would be

very useful because it would make the job easier for firemen to find humans. Another future technology is VR that recreates the room the fireman is in, allowing them to see through smoke. Part of our vision is to use virtual reality inside the visor to recreate the room but filtering out the fire. Virtual reality works by two lenses in front of each eye. The science behind our project: VR can help see through smoke by having a thermal camera so you can see through the smoke. Another way we can use VR is thermal imaging can see anybody who is in need for help and so we can see any kids who are scared and hiding under anything so we can save them quickly before the fire harms their body or does any further damage so they couldn't get out.

We want to use Graphene in the materials for the helmet to make it stronger, lighter and impermeable to gases. When you add graphene-based nanocomposites which are essentially incorporating nanosized particles of graphene into other materials to improve the properties for the helmet.

4. Breakthroughs

For our visor, one of our breakthroughs would be in the area of artificial intelligence. We need AI to create the safest route to get the injured person out of the dangerous situation without hurting the fireman. Another breakthrough is thermal imaging. We need thermal imaging to locate a human body through the fire. This would also be challenging because the fire is hotter than the human body. A study we would conduct would be putting a smoke detector inside a

fully sealed suit, and put it into a fire training area. If the smoke detector goes off, we would know it would be a failure.

5. Design Process

We first focused on just making the mask intelligent by adding VR and AI but we learned about the dangers to the firemen and added ways to protect them with new sensors and using graphene to make the mask lighter and stronger. As we researched, we thought AI could filter out smoke but quickly learned AI is a computer program that can learn and provide firemen with information or instructions. We spent time on how to improve the safety and thought about ways to seal the mask better. We learned about sensors and thought it would be great for the firefighter to know if the mask is not sealed or if they are dealing with dangerous contaminants.

6. Consequences

Every technology can have positive and negative impacts. A positive impact would be the fact we would be saving lives by having a safer mask. The opposite of that would be the fact that this technology would be experimental and there would be a few flaws while the technology is still new.

With any good invention comes flaws and that is no different with this project. A positive would be that it would help firefighters find the humans resulting in more saved lives. It would also reduce the probability of getting cancer or some type of lung disease because the mask

would be tight. The mask would use a lot of testing which could result in death, injury, and lung disease.

III. Bibliography

Figure 1 created by team

Web Design Images:

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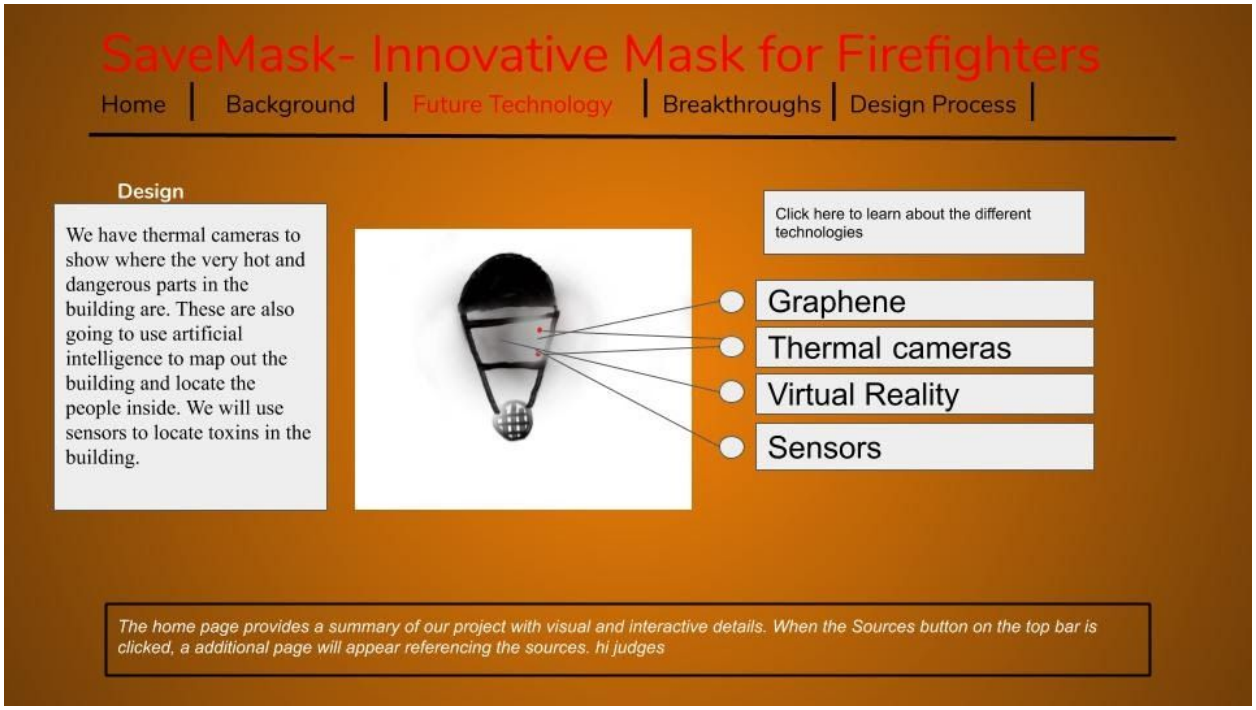
IV. Sample Web Page

Page 1.

Page 2.


SaveMask- Innovative Mask for Firefighters
Home | Background | Future Technology | Breakthroughs | Design Process | Sources
Today the technology used by firefighters is limited and out of date for the scenarios where deadly gases and fumes get inside them and end up getting them killed. One current technology is thermal imaging cameras (TIC). The TIC's are inside the mask and can not locate people inside the building.

Page 3.


SaveMask- Innovative Mask for Firefighters
Home | Background | Future Technology | Breakthroughs | Design Process |
Design
We have thermal cameras to show where the very hot and dangerous parts in the building are. These are also going to use artificial intelligence to map out the building and locate the people inside. We will use sensors to locate toxins in the building.
Click here to learn about the different technologies
Graphene
Thermal cameras
Virtual Reality
Sensors
The home page provides a summary of our project with visual and interactive details. When the Sources button on the top bar is clicked, a additional page will appear referencing the sources. hi judges

Page 4.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For our visor, one of our breakthroughs would be in the area of artificial intelligence. We need AI to create the safest route to get the injured person out of the dangerous situation without hurting the fireman. Another breakthrough is thermal imaging. We need thermal imaging to locate a human body through the fire. This would also be challenging because the fire is hotter than the human body. A study we would conduct would be putting a smoke detector inside a fully sealed suit, and put it into a fire training area. If the smoke detector goes off, we would know it would be a failure.

Page 5.


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Home | Background | Future Technology | Breakthroughs | Design Process
We first focused on just making the mask intelligent by adding VR and AI but we learned about the dangers to the firemen and added ways to protect them with new sensors and using graphene to make the mask lighter and stronger.
Thermal Imaging Cameras will be used to show where the heat is concentrated and where it is unsafe to travel.
Graphene is a form of carbon a single atom tall. Graphene can be transparent or solid. Graphene can be used to create bullet proof vests and bullet proof glass.
One thing we cancelled was quantum computing. We cancelled this because there was no real use for it. There would be no use for it because the smoke would block out any connection.
When a circle on the timeline is clicked, the attached text and/or photo will enlarge. To exit back to this page, click the "x" on the corner of the text.