

Crawling Fire

Flow Visualization Team#2 Project -3

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Final Video Snapshot:



Fig: 1 'Crawling Fire' – Snapshot of the final video showing controlled flame propagation

1. Introduction:

The video 'Crawling Fire' was submitted as a part of coursework for Flow visualization Group project -3. The basis of the project is visualization of the flame propagation under controlled conditions.

The project started with the motive of capturing sparks from a magnesium flame starter using a high speed camera. Due to constraints with lighting and narrow field of view provided by the 'Olympus i-speed' camera the intended project was not attempted. Instead, a more dramatic and entertaining video was considered to provide variety to my work record.

2. Physical description of components used in the experiment:

Magnesium Fire Starter: (from Gerber 'Bear Grylls' Multitool Survival kit) ^[4]

This magnesium fire starter is rugged and designed for the outdoor enthusiast or comes as part of a survival kit. The magnesium fire starter uses a large 3mm diameter composite flint steel rod that has magnesium built into it. It uses striking blade that maximizes the sparks and ensures the ignition of any suitable fire starting material/ tinder. It is designed to function on wet or dry environment and is made from corrosion resistant high strength materials.



Fig2: Gerber 'Bear Grylls' Multitool used in the experiment

To use the magnesium fire starter, the striking blade is struck against the fire starting rod resting at 45 degree angle. While holding the fire starter firmly in one hand, the striking blade is moved in a fast smooth manner while pressing firmly against the flame starter, maintaining the optimum 45 degree angle. When this is done properly, the fire starter will emit incredibly bright and hot sparks that will burn and ignite any suitable fire starting material.



Fig:3: Fire starter in action ^[5]

Purell Hand Sanitizer:

The commonplace hand sanitizer contains flammable 70% w/w ethanol and < 5% Isopropanol ^[2].

Toilet paper roll:

A standard double ply toilet paper was used for the experiment.

3. Visualization:

The toilet paper is laced with hand sanitizer. The camera is focused in the lacing by holding any object above it. The video is turned on and the flame starter is used to ignite the lacing from one end. It should be made sure that the ignition is done quickly as possible as the ethanol vaporizes to the atmosphere faster. Black backdrop was used to capture the detail of the flame. The entire experiment was done in a dark room.

4. Videography:

The camera was mounted on a tripod and focused straight on the flame. The distance between the flame and the lens was approximately 0.25 meter. The video was recorded using Canon T3i camera using 18-55 mm kit lens. Four successful trials out of five attempts were gathered.

5. Post Processing:

Post processing was done using Microsoft Movie Maker.

The video was shot with a resolution of 5184 X 3456 and was edited to 1920 X 1080 pixels to fit most of the screens.

Background music 'Black Vortex' by Kevin MacLeod ^[3] was added with license under Creative Commons. The cinematic was edited and adjusted to fit the 'epic' theme of 'Black Vortex'.

6. Safety:

While dealing with flame, safety is paramount. The following safety points were ensure while during the experiment and there shall be no compromise with these rules while reproducing the experiment

1. Keeping the surroundings clear from flammable material. The hand sanitizer and toilet paper should also be moved away prior to ignition.
2. Wearing Personal Protective Equipment like welding gloves, welding aprons and eye protection.
3. Having a suitable fire hydrant nearby.
4. The area should be properly ventilated, preferably a place with gas vent like a welding booth.
5. Always having a second person to overlook and act in case of emergency.
6. Making sure the area is safe and back to normal condition after the experiment.

7. Perspective and the Crawling Fire Theme:

The final video 'Crawling Fire' is dramatic as well as emotional. It describes the soft side of fire though it is still burning material. The fire is controlled and moving slowly in a defined path which comes in contrast to the common destructive and powerful perspective of fire. It also kindles a wide range of thought or imagination in the mind of the observer depending on their perception and state of mind.

8. End note:

The video succeeds in being dramatic or for some, over dramatic. The camera shake is very distracting and should be avoided in all costs. It is a better idea to confine the flame within the field of view of the camera. The flame can also be shaped by changing the shape of the lacing and interesting flame patterns can be made. It was also observed during the experiment that positioning the plane of the paper perpendicular to the direction of gravity does not give good results. Instead, the camera can be moved to cover the flame from the top.

9. References:

[1] Magnesium fire starter product description from

<http://www.campingsurvival.com/aufistflstan.html>

[2] Composition information from

http://gojo.com/en/Home/United-States/~media/GOJO/Products/MSDS/US%20Canada/English/PURELLAdvancedGreenCertifiedInstantHandSanitizer_07111.pdf

[3] Music 'Black Vortex' sourced with permission from incompetech.com

[4] Gerber 'Bear Grylls' Multitool Survival kit:

http://www.gerbergear.com/Survival/Tools/Bear-Grylls-Survival-Tool-Pack_31-001047

[5] Fig.3 source

<http://www.besportier.com/joshherder/bear-grylls-ultimate-survival-kit.html>