A Pilot Study of Likely Crime Areas on Mizzou Campus Using a Low Cost EEG Device

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ABSTRACT:
In recent years, there has been an increased number of crimes on the Mizzou campus and other campuses across the country. Students do not feel as safe as they used to. A Fox News report, in 2012, stated that “spotty lighting” was part of the reason. We wanted to explore whether this was true and whether other environmental features increased the perception of crime at Mizzou. With this project, we wanted to measure student’s perception of likely crime areas and to cognitively corroborate the relationship between specific campus features and occurrence of crime. The purpose of the study is to help designers and law enforcement to identify environmental features of crime. Since this is a pilot study, there are no concrete conclusions but the findings show some interesting insights.

HYPOTHESIS:
Environmental features such as the degree of visibility have an effect on the perception of crime in likely crime areas of Mizzou campus.

Directional Hypothesis:
- Lower degrees of visibility will lead to a higher perception of crime.
- Higher degrees of visibility will lead to a lower perception of crime.
- Encountering spotty lighting leads to a higher perception of crime.

FINDINGS:

![Mapping of environmental features including trees, buildings, and lighting](image)

**RESULTS:**

As per our hypothesis, space syntax maps show that East campus had lower visibility than west campus. When crime statistics are checked for these two areas, east campus has a higher crime rate than west campus. The experimental results show that while the difference in mediation levels was minimal between East and West campus the degree of attention was higher in East campus than the West campus. We also observed specific inflection points when the attention and mediation levels were triggered. A recognition level was aroused while encountering movement (vehicles and people) and sudden spots of illumination (car lights).

Inflection points according to Neurosky Mindwave

Mediation levels were found in spaces where there was more uniform lighting. While the study sample and scope does not allow us to make any concrete inference, it provides an insight into the possibilities of measuring environmental features using EEG devices. The pilot study will help us to create a more elaborate experiment with a large sample size and more refined measurements.

**TERMINOLOGIES AND VARIABLES**:

**Dependent Variables:**
- Crime: An action that constitutes an offense that may be prosecuted by the state and is punishable by law. For this study any criminal incident that occur in the streets are considered. Those include assault, vandalism, theft, and burglary.
- Perception of crime: An emotional state in which one perceives the occurrence of crime whether it has actually occurred or not.

**Independent Variables:**
- Environmental features: The degree of physical properties of a space that have an impact on the user’s emotional experience. For this study, our independent variable is the degree of visibility and spotty lighting measured. Visible amount of open architectural spaces are due to lesser density after lighting and surveillance.

**MEASUREMENT:**

**Visibility Analysis and crime Mapping:**
As a case study, we chose environmental features of a portion of the east campus (high crime area) and compared it with a portion of the west campus (low crime area). The independent variable of the study was environmental features for this study is restricted to measuring degrees of visibility. The mapping of environmental features was conducted by the tedious process of physically traveling to these locations and capturing every environmental feature such as the heights and locations of buildings and trees. We then input these features into a visibility mapping software called Space Syntax. Visibility is measured through software called Space Syntax with Using a multi-platform DepthmapX, a visibility graph analysis (VGA), we extracted a map showing degrees of visibility using color coding. Those areas represent less degrees of visibility compared to red areas (more visibility). We then compared these maps to statistics on the occurrence of crime gathered from the web.

**Experiment on Perception of Crime:**
The experiment was conducted on the east and west campus during night time by conducting a nighttime walking video recording of the two areas which we used as a stimulus for our perception of crime experiment. Students were divided into two groups and a head-mounted EEG device called Neurosky Mindwave to check the user’s attention levels (caused by fear) and meditation levels (caused by lack of fear). The Neurosky Mindwave is an eight-channel device for recording electrical signals from the brain. The device is worn on the head and consists of a headband, an ear-clip and a sensor arm containing the EEG electrodes which rests on the forehead.

Although made up of a single dry sensor, compared to other high-end EEG devices it is mobile and inexpensive. The testing was conducted in a closed environment lab instead of the real environment, for personal safety. We conducted a baseline test and used incremental of “+10” to get a comparison of the readings as a pre-test window before measuring the attention and meditation levels using Neurosky. Inflection points were found in testing that gave us information to compare between each individual. A questionnaire of five point Likert scale using a Psychometrics Basic questionnaire were used after the experiment to further check attention and meditation levels.

**References:**

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