**From: EDD 104 Section 54**

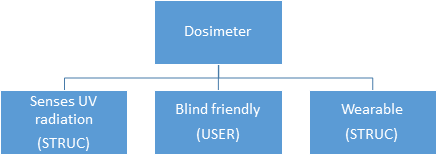
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**To: Professor Gieskes, Professor Martin**

**REQUIREMENTS and CRITERIA JUSTIFICATIONS**

**Design Statement:** Create a wearable dosimeter for the blind that detects UV radiation and provides a means for reporting and monitoring.

**System Structure:**



**Project Verifications Approaches**

Definitions

Computer: Electronic computing device

EPD: Electronic Personal Dosimeter

UV: Ultraviolet

ATM: Units of measurement for water resistance 1 ATM is the standard pressure of the atmosphere at sea level.

System Requirements (Higher Level)

**[DOSE 1.1] The device shall measure the amount of UV Exposure**

This can be verified with logical argument. Our device will be able to read and interpret different amount of UV exposure.

**[DOSE 1.2] The device shall inform the user of the level of exposure upon request**

This can be verified with logical argument. Our device model shall have a function that can tell the user what levels of UV it reads at any instant.

**[DOSE 1.3] The device shall be completely usable by a totally blind individual**

This can be verified by logic argument. If our device is tested and used by a blind individual no sight, it will be usable by blind users.

**[DOSE 1.4] The device shall be reusable**

This can be verified with logic argument. If our device can be used multiple times without needing to be replaced, it will be considered reusable.

**[DOSE 1.5] The device shall warn the user when dangerous levels of exposure are read**

This can be verified with logical argument. Our device will include a feature so that if it reads a certain UV level it will alert the user.

**[DOSE 1.6] The device shall be worn on the body**

This can be verified with logical analogy. Our device will be worn on the body via a mount that could be like a hip pedometer that attaches via clip, or a device that can clip onto a hat.

Subsystem Requirements (Lower Level Subsystem)

**[STR 2.1] The device shall have an on/off function. {DOSE 1.1}**

This can be verified with logical argument. The design model will show that the device is built with an on/off function.

**[STR 2.2] The device shall be rechargeable. {DOSE 1.4}**

This requirement can be verified with a logical argument. The device shall be powered by a type of battery that can be recharged via outlet or replacement battery.

**[STR 2.3] The device shall weigh less than 2.5lbs. {DOSE 1.6}**

This can be verified with calculations. By determining the total weights of the materials used, we can add the values to confirm that the weight is under 2.5lbs.

**[FUN 2.1] The device shall be an EPD. {DOSE 1.4}**

This requirement can be verified with a logical argument. The device will be built with electronic components making it an EPD.

**[FUN 2.2] The device shall store data. {DOSE 1.2}**

This requirement could be verified with logical argument and analogy. The device would have internal storage capabilities large enough to record daily values of UV light readings.

**[FUN 2.3] The device shall transfer data. {DOSE 1.2}**

This requirement can be verified with logical argument and analogy. The device would have a port on it so that a computer can read the data and copy it to the computer itself.

**[FUN 2.4] The device shall determine when a user is exposed to a dangerous level of UV radiation. {DOSE 1.5}**

This can be verified with logical argument. We will be adapting technologies that can read and determine dangerous levels of UV rays from the UV index scale.

**[FUN 3.1] The device shall emit a warning when a default level of at least 6 in the UV index scale is detected. {FUN 2.4}**

This can be verified with logical argument. The device will make a warning noise and/or vibration to alert the user that they are experiencing an unsafe level of UV rays.

**[FUN 3.2] The device shall be able to account for personal risk factors. {FUN 2.3}**

This can be verified with logical argument. By allowing the warning level of the UV index scale to be adjustable, the device can meet the needs of the consumers based on the variables that increase personal risk.

**[USR 2.1] The device shall use audio feedback methods. {DOSE 1.3}**

This can be verified with logical argument. We could design our device to use a speaker to give audio feedback.

**[USR 2.2] The device shall use haptic feedback methods. {DOSE 1.3}**

This can be verified with logical argument. We could design our device to use a haptic engine to give vibrational feedback.

**[USR 2.3 ] All user inputs shall be differentiable by touch. {DOSE 1.3}**

This can be verified with analogy. The device would have braille letters on the buttons and/or different shapes/symbols to represent different functions, similar to braille signs seen in public.

**[USR 2.4] The device shall offer immediate feedback after input is received. {DOSE 1.2}**

This requirement could be verified with logical argument. Our device would utilize a button or switch that shares the readings currently on the dosimeter with the user.

**[PFR 2.1] The device shall record the amount of received UV radiation to at least 90% accuracy. {DOSE 1.1}**

This can be verified with logical argument. We could compare our design to a UV sensor that has at least 95% accuracy to see if the values on both are at least very close.

**[PFR 2.2] The device shall remain attached while the user performs daily activities. {DOSE 1.6}**

This requirement could be verified with an analogy.

**[PFR 2.3] The device shall have an IP rating of at least 66. {DOSE 1.6}**

This requirement could be verified with a logical argument. If the device or a prototype is tested to meet the standards that make it IP 66, it will be waterproof to a certain extent.

**Pahl & Beitz Matrix**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | Design Candidate 1 |  |  | Design Candidate n |  |
| Criteria | Weighting Factor (W) | Numerical Value (NV1) | Weighted Value (W\*NV1) | ... | Numerical Value (NVn) | Weighted Value (W\*NVn) |
| Cost | 0.05 |  |  |  |  |  |
| Compact | 0.1 |  |  |  |  |  |
| Function | 0.2 |  |  |  |  |  |
| User Interface | 0.3 |  |  |  |  |  |
| Performance | 0.3 |  |  |  |  |  |
| Aesthetics | 0.05 |  |  |  |  |  |
| Sum | 1.0 |  |  |  |  |  |

**Justification of Evaluation Criteria**

**Cost:** The cost is the least important because existing dosimeters are already expensive, and although a low-cost device would be preferable, we should not sacrifice performance for cost. For this reason, we gave cost a weight of 0.05.

**Compact:** The device must be small enough to be reasonably mounted to the user’s body, but the device must have a sufficient size to contain necessary components that increase the accuracy. For this reason, we gave this criterion a weight of 0.1.

**Function:** The function is weighted second most important with a weight of 0.2 because the main intention for the device is to detect different levels of UV radiation and give adequate feedback.

**User Interface:** The interface is important in our design because a blind individual must be able to navigate the various functions of the device. For this reason, we gave this criterion a weight of 0.3.

**Performance:** The performance of the design is the most important because, without sufficient medical accuracy, the device would not be viable for daily use. This is the reason that performance was given a weight of 0.3.

**Aesthetics:**  The aesthetics is the least important because as long as the device is not socially inhibiting, a blind individual would not be as concerned by the aesthetic appeal. For this reason, aesthetics was given a weight of 0.05.