Project Statement
Olfaction Satisfaction

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NSF Engineering Design Projects:
Olfactory Stimulation Device

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I. Statement of Need

The purpose of the project is to develop an olfactory stimulation device for the Passionworks Studio, which provides aid and services to severely disabled adults. Individuals with these severe cognitive and motor disabilities find themselves in an environment that lacks stimulation of their senses. In response to this situation, the device’s main purpose is to provide stimulation of the individual’s senses. Activities such as watching television or playing video games are far too complex for such individuals to enjoy. For this reason, simple interactive devices have been developed to stimulate the individual’s senses of touch, sight, and hearing. However, the sense of smell is largely without stimulation in these current devices and, as a result, the individual’s sense of smell is left without stimulation. Therefore, the purpose of the olfactory stimulation device is to stimulate the olfactory senses in conjunction with the other senses of touch, sight, and hearing. This provides the individual with a more complete stimulation of the senses.

It must be emphasized, however, that the disabled individuals require a device that is simple to use. It is known that devices that are too complex to use will frustrate and anger the disabled individuals. Hence, the olfactory stimulation device will emit scent upon input from a simple adaptive switch interface that is controlled by the user. Furthermore, the device must not possess external wires of any kind, as individuals have been known to pull on, chew, and break wires. Finally, the device must be durable and be able to withstand repetitive actions (i.e. repetitive activations of the device) that the disabled adults have been known to perform.

II. Basic Preliminary Requirements

The individual’s olfactory sense must be adequately stimulated in order to facilitate coordination among the other senses. The fragrance will be released in response to interaction with external adaptive switches that are controlled by the user. There are two types of switches that best suit the needs of the disabled individuals: 1. a large touch pad and 2. a “squish switch” (a ball like switch that is activated by a squeezing action). These switches are external to the device and should be interchangeable to provide for the individual’s motor needs (i.e. some work better with touch pads, while others work better with a “squish switch”). The switches, upon activation, will cause the olfactory stimulation device to release scents from a liquid or oil reservoir. The reservoir should be able to be removed, cleaned, and filled with other scents as desired.

The size of the olfactory stimulation device should not be too large so as to make it cumbersome; neither should it be too heavy for the same reason. Ultimately, the device must be mobile enough for any individual to move it without too much effort. Besides being mobile, the device should be able to be used on the table or floor level. Furthermore, the base should be wide enough to provide stability and support for all liquid or oil fragrances within the device. This is to prevent the fragrances from spilling while in the device.
To provide for the most simple and easy-to-use interface possible there should be two interchangeable switches; one for selection and the other for fragrance release. The fragrance chamber will contain multiple scents that, upon activation of the selector switch, will allow the user to diffuse a specific fragrance. Then, upon activation of the release switch, the chamber will allow the scent to diffuse into the atmosphere providing stimulation of the individual’s sense of smell. Basically, the primary goal for this project is to create a device that is user-friendly and safe for any users regardless of ability.

III. Basic Limitations

One of the major limitations associated with this project pertains to the budget of 750 dollars. Since this budget must not be surpassed, it is an important factor to keep in mind when designing. This becomes especially crucial when deciding on the type and number of input switches since those requested are rather expensive in relation to the budget.

The other major limitations involve safety issues. Due to the disabilities of the expected users of the device, it is dangerous to assume that the device will be handled with care. It is very possible that the device will be handled roughly and without concern for possible injury from an electrical shock or an unsafe exterior (i.e. sharp edges, protrusions, etc.).

In addition to the possible harm of the user, improper handling could lead to device malfunction. For instance, the fragrance substance could spill causing damage to electrical or other components within the device. Also, there should not be any wires or cords running from the device that can be harmful or hazardous as individuals may chew on the wires or choke themselves with the wires. Because of these concerns, it is necessary to design the device with these safety features in mind:

1. The device should be free of any exterior hazards such as sharp corners, rough edges, or protruding objects. Therefore, the device must have a smooth exterior.
2. The device should also be free of the potential for electric shock. This can be accomplished by eliminating an exterior electric cord and not having any exposed wires. For this reason, the device must be battery powered.
3. Additionally, the fragrance substance should be contained in such a manner to prevent a possibility of spillage. For this reason, the device should have a wide base to provide enough stability to reduce spillage to a minimum

In general, the device should be designed sturdy enough that a fair amount of handling would not result in harm to the device or the individual user.

Finally, The Americans with Disabilities Act also has two regulations that might apply to this project. Character limitations on any letters or numbers must have a height to width ratio between 3 to 5 and 1 to 1. In addition, the stroke width to height ratio must be between 1 to 5 and 1 to 10.
IV. Other Data

In 1998, Passionworks was created in Athens, Ohio with the hope of providing services for adults with developmental disabilities. Currently serving 135 disabled adults, the program identifies the particular abilities of each participant and helps them express themselves creatively through their determined strengths. To further this goal, Passionworks creates art pieces and translated artwork into items such as jewelry, clocks, ornaments, and greeting cards to sell and provide funding for the organization.

Within Passionworks is the Multisensory Stimulation Device Room, which contains sensory stimulation devices that encourage participation and interaction among the disabled individuals. This room is designed to provide a way for the disabled adults to increase their interaction with their environment through stimulation. The Multisensory Stimulation Device Room already contains various devices including several rocking devices, stereo system with head phones, stimulation wall with several items of varied shapes and textures, and several types of lights (bubble lamps, Christmas lights, and fiber optic lamps) with adaptive controls. These varied devices stimulate the auditory, visual, and tactile senses.

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V. Questions

1. What are the desired dimensions of the device?

2. What types of scents are desired?

3. Do any allergies exist?

4. What is the desired weight of the device?
5. How much fragrance should be dispensed?

6. Should these fragrances be commercially available?
VI. Technical Areas

Communications
Control
Digital Electronics
Computer Programming
Instrumentation and Analog Electronics.