Team 5

The Sunriser

PURDUE UNIVERSITY
Mechanical Engineering

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Lab Time: 8:30-10:30am
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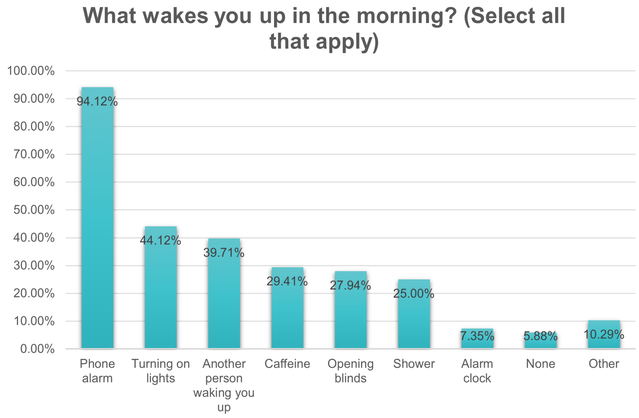
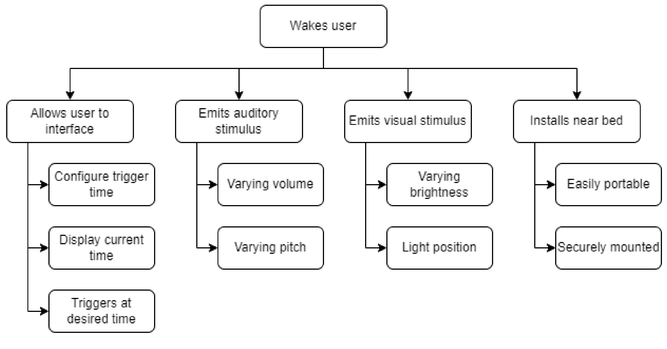
Problem Statement

Despite existing sleep-waking solutions, over 90% of adolescents have trouble waking up, leading to problems such as sleep inertia (Amaral et al., 2014). Additionally, current solutions (like the alarm clock) are linked with adverse health outcomes such as strokes and heart attacks due to their disruptiveness (Kim, 2023). Thus, the team is attempting to create a design that makes waking easier and non-disruptive and allows users to live healthier lives.



FUNCTIONS

The main function fulfilled by the product is the waking up the user in a peaceful, non-disruptive manner. The subfunctions identified were that it needed to possess a user interface, emit auditory and visual stimuli, and capability of install near bed. These subfunctions were furthermore split into secondary subfunctions. The user interface function was categorized by the capability to configure trigger time, display current time, and trigger at a specific time. Emitting auditory stimulus required varying pitch and varying volume. Emitting visual stimulus requires varying brightness and adjustable light position. Lastly, installs near bed was categorized as easily portable and securely mounted.



Primary Concept Description

The Sunriser is an alarm that raises the user's blinds in the morning and exposes the room to natural light. The critical components of this design include a belt attached to the blind's tassels, a pulley motor, and an electronic clock. The user can interact with the button interface to set the trigger time when the device will pull open the blinds.

From the end-user's perspective, the device is a single unit that is clamped to a typical bedroom windowsill. The user can program the trigger time and other settings from the interface buttons on the device. When the appropriate time is reached, a motor will pull the belt, opening the blinds and exposing the room to natural sunlight. The user simply needs to plug the device into wall power and attach the tassel clips to the blinds.

The Sunriser addresses the following key quantitative and qualitative engineering specifications:

Quantitative
- Must wake user from sleep at least 95% of the time
- Must cost less than $120 per unit for the customer
- Must last more than 2000 use cycles

Qualitative
- Must allow adjustable settings
- Must not have adverse health effects (non-disruptive)
- Must encourage user to get out of bed

Comparison to Benchmarks

Customer Requirement	 Clocky	 Philips SmartSleep	 Sunriser
Low Cost	$40	$180	$120
Low maintenance	Yes – battery powered	Yes – plugs into wall socket	Yes – plugs into wall socket
Configurable	Yes – time to alarm	Yes – time to alarm, brightness of light, sounds	Yes – time to alarm
Durable	Yes – according to customer reviews	No – fragile screen	Yes – strong exterior material
Dependably wakes customer	Yes – auditory stimulus, requires customer to get out of bed	No – light does not dependably wake all consumers	Yes – requires customer to get out of bed
Portable	Yes 3.94" x 1.97"	Yes 8.8" x 8.6" x 4.7"	Yes 5.5" x 5.5"
Non-disruptive	No – loud alarm, strikes into furniture and potentially the user	Yes – gradual sound volume and light brightness increase	Yes – natural light and moderate sound volume

KEY ENGINEERING REQUIREMENTS

The most important design requirements are that the design must wake users 95% of the time, must cost less than $120 per unit for the user and must last more than 200 cycles. Additionally, it must have adjustable settings and be non-disruptive. The evidence shows that the first requirement is met by the design, as it utilizes both visual and auditory components that have both been tested in other designs that should carry over to this design. The cost was equal to $120 so the target price requirement was achieved. The durability of the product should easily last at least 200 cycles based on the lifespan of parts used. The adjustable settings were built into the design and feature three buttons to allow for setting of time and alarm. Lastly, due to use of natural sunlight the product will be mostly non disruptive.