

# Sunrise Based Alarm Clock

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## Abstract

As the name implies, the purpose of an automatic night lamp is to turn on or off the light without the need of human interventions. In the recent papers, the authors have designed and developed a system that stimulates the sunrise using RTC. The project aims to maximize the health benefits of waking up naturally, as waking up abruptly because of alarm noise can cause higher blood pressure and heart rate. Unlike smartphones or traditional alarm clocks that rely solely on sound to wake you up, this project aims to mimic the coming of dawn with ever-increasing amounts of light.

## Keywords

RTC Module, Sunlight, Melatonin, Alarm, Sunrise Based Alarm Clock, RTC based Alarm Clock.

## 1. Introduction

Alarms are very important and essential part of our life whether it is in personal life or in industrial life. They are used from ages and first they were used in mechanical types using sound as their main way to wake up a person later in this industry there were alarms which wake up you by vibration and sometimes little electric shocks, these were the various types in which electronics or mechanics used to play role in waking up a person, these methods sometimes seem useful sometimes not as a person needs a motivation to wake up as a routine in daily basis, making alarms in daily life make sure you wake up in correct time and go to your work or desired destination on time nowadays alarms are also used as reminders[1] to remind you of a certain task, alarms are also a cause of irritation in some persons the alarm causes headache for some persons and some persons do not wake up even in the sound of alarm these persons are sometimes tired and sometimes creature of habit, and when a person snooze his/her alarm to get sometime for sleep there begins a habit of procrastination in the starting of the day. In the early ages when there was no alarm people use to sleep in the presence of nature and this build their habit to wake up at the time of sunrise this waking up was defined as a circadian rhythm by scientists and when a person creates a habit of waking in such a natural way the body programs itself to wake up about that time, even these days when we see movies and other types of documentaries a person wakes up and opens his window letting the sunlight come in the room which wakes everyone else in the room this also has a scientific explanation later explained in the project, In today's era there are alarm which make nature's sound to make you feel like you are in nature and these sounds i.e. the chirping of birds the sound of waterfall the slow sound of blowing wind and leaves pushed by the gushes of wind make you feel like you are in nature and this types of sounds help to elevate our mood and we wake up in a good mood. Each and every person wakes up to his/her convenience or cause and sometimes some persons creates their own way to wake up someone, sometimes a prank and in odd times when a person is in negligence of the cause they need to wake up like when as a kid our mother used to wake up by slowly speaking our name and the irony here is this would be also a alarm for human body, in some mischievous adults, as a prank they use to throw water over their face, tickle their feet or ears, sometimes these methods leads to serious injury to the person itself and to the person it is applied to also. So they should not be used as a practice. Making a alarm is easy sometimes a alarm is made using microprocessors and sometimes there are mechanical alarms, the mechanical alarm clock uses time and triggers a lever which releases a pre-tensioned mechanism which rings a bell or triggers some sound making elements.

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When an alarm is made using microprocessors[7-10] as a DIY[11] then there are required some technical skills there are many platforms on which we can build a alarm clock, there are also a way to make an android application which takes input as time and when time matches the time as the time set by user the alarm rings, some alarms uses brightness control systems[12-14], when a alarm are made using microprocessors like Arduino uno, Arduino r3, Arduino nano, raspberry pi, other programmable electronic boards then they require integration of other equipment like a RTC Module, these module can store time in themselves as long as one year is left alone until its battery dies, these RTC are also used in CPU to store time when the computer shuts down and when the computer starts the CPU fetches time from the RTC, alarm can also be used by making LDRs these are the light dependent resistors the resistors shows conductance in presence of light and shows resistance in absence of light this makes them useful not only in alarms but also in automatic street light[15-16] projects where the same mechanism is applied.

An automatic night lamp using a microprocessor is a counterfeit light source that is incorporated into a standard computerized clock. It is planned to wake an individual at a chose time gradually. When there is darkness, the human body secretes a hormone called Melatonin which is responsible for feeling sleepy and the gland responsible for secreting this hormone is enigmatic pineal gland which functions in response to the darkness. Melatonin hormone gradually gets released into the stream of blood, reaching different parts of the body, signaling the body to sleep. As soon as the body gets exposed to the light, it stops secreting this hormone that helps you wake up naturally. The proposed system stimulates the sunrise with the help of a pre-coded circuit that will get triggered when the code will receive the time from an RTC, which will be the average time of sunrise.

## 2. Literature Table

**Table 1**

Literature Survey

Objectives	Software/Hardware Requirements/Programming	Algorithm/Methodology/Techniques/Models	Result (Accuracy or Any other parameter)	Finding/Achievement
Night Lamp [1].	1.Microphone 2.Amplifier 3. Monostable 4.Transistor 5.LED	Sound trigger to on/off 2. Reset button to on/off	--	When the use will clap or use the reset button the night lamp will turn on or off according to its present state
Energy Conservation [2].	Diode, BC 547, LDR, Relay, Voltage regulator, Motion sensor, Bulb , Resistor, Adapter., LM 358	1)LDR Based switching 2) Adaptive Brightening of light	Case 1: Heavy traffic =216 watt per month Case 2: Light traffic =2100 unit per month for all lights	Extremely affordable in light of the fact that it is an exceptionally modest financial plan project. In this way, it can play a significant guideline to save energy utilization.
Automatic Night Lamp [3].	LED,8255, resistors, LDR, Buzzer, capacitors, IC 555 and Transistor NPN.	The Timer IC result goes low when light falls on the LDR and the clock IC result goes high when	--	The result is the Buzzer will be functioning according to the timer IC555, which takes input from LDR.

		the LDR was put in dull		
Energy Conservation [4].	1. LDR [3] Voltage: DC 3-5V, 5mm, 1.8 gm. 2. Arduino Uno [5] 22 pins, operating voltage 6-20V 3. LEDs [6] 5 mm , operating voltage 5V 4. IR obstacle avoidance sensor, Range 2-30cm, Angle 35 5. Resistors [25] 100-ohm, 220-ohm. [4] Voltage: DC 3-5V	The sunlight will give the input to LDR for it is day or not, if night the Arduino will tell IR sensor to brighten or lower the brightness of the lamp according to the traffic on the street.	--	Energy Conservation is achieved through the proposed model
Preservation of growth of aquatic agriculture. [5].	The lighting-control device consists of two primary components: an electronic power control circuit and a mechanical or electronic timer to activate and deactivate that circuit. The circuit includes 20 solid-state electronic components, two fuses, and an AC transformer.	Simulation of sunrise to sunset	It showed the implementing the system improved the aquatic life thus improving the livestock for agriculture of aquatic life.	Additional testing is required to more precisely determine mean time to circuit failure, the performance of the circuit with components that change the activation and deactivation times, and the effects that various lamp loads may have on circuit performance.
Model a more compelling and wonderful morning timer for the hearing impaired [6].	--	1. Visual: dawn mirrored utilizing bedside light 2. Physical: vibrating wristbands 3. Audio: bells with two pitch choices	--	Sound and actual cautions completely utilitarian. 1. One visual caution functional – Successful at waking client 2. Time keeping precision exceptionally poor – Postponed by roughly 2 seconds each moment – Outside oscillator started meddling with LCD after harm to circuit board happened during testing

### 3. Literature Review

In the survey, LDR is used as their main sensor for working of the project, here the drawback is that the LDR needs a threshold amount of light for its working, also the morning alarm clock will be placed inside a room. So, if the room is already dark with no windows, the system would fail [2][3][4].

The system needs mechanical or electronic timer to activate and deactivate that circuit which is not possible as the person is already in sleep [1][5]. The system flickers the lights in the lamp which tells a deaf person that its time of morning, here due to flickering the chances of confusion to the person and the life of the system decreases [6].

## 4. Proposed System

To solve these problems, we build a system in which the idea is, our body feels sleepy if there is a dark and cold atmosphere. When there is dark, our body secretes a chemical called Melatonin which is responsible for feeling sleepy. When you get exposed to the light, your body stops secreting this chemical which helps you wake up naturally.

In our system we are trying to stimulate sunrise to do the same function. Our device will work on a pre-coded circuit [7-9] that will get triggered when the code will receive the time from a RTC [10-11] which will be the average time of a sunrise. For a backup, if the user doesn't want to wake up at that time, he/she can set an alarm.

By doing this, the user can wake up without the buzzing sound of the alarm that we casually use. Our system helps you to wake up naturally without getting irritated and in the long run there are proven health benefits of waking up naturally. Some of them are:

- 1) They tend to feel more rested and relaxed without feeling lazy throughout the day.
- 2) They report a better overall mood and outlook.
- 3) They make healthier choices more often.

If we try to make the circuit connected to an API which can tell the sunrise and sunset time, there will be more precise wakening as the outdoor sun and the indoor lamp will be in sync.

## 5. System Specifications

A. Software Platform

a) Arduino.exe

B. Hardware Platform

### 5.1 Arduino Uno

In Fig.1 Arduino Uno is shown, Arduino UNO is a minimal expense, adaptable, and simple to-utilize programmable open-source microcontroller board that can be incorporated into an assortment of electronic activities. This board can be interfaced with other Arduino board, Arduino shields, Raspberry Pi board and can handle transfers, LEDs, servos, and motors as a result.

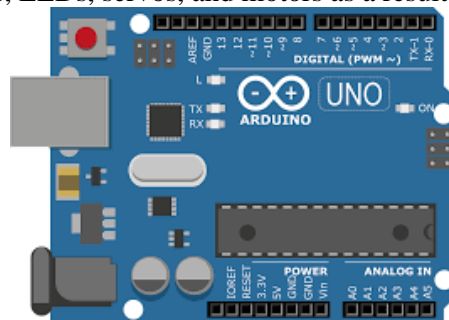
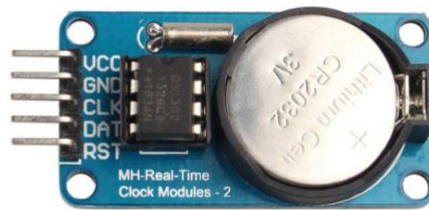


Figure 1: Arduino Uno

### 5.2 RTC Module

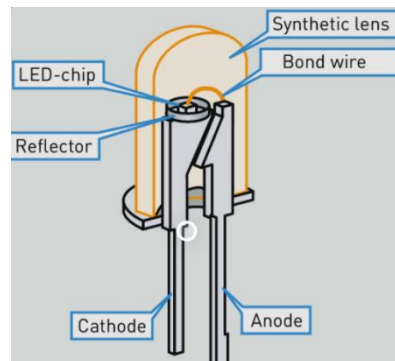
In Fig. RTC module is shown, RTC is an electronic gadget as an Integrated Chip (IC) accessible in different bundling choices. The motivation behind a RTC or a constant clock is to give exact time and date which can be utilized for different applications.



**Figure 2:** RTC Module

### 5.3 LED Lights

In Fig.3 Led is shown, A light-transmitting diode is a semiconductor light source that emanates light when current moves through it. Electrons in the semiconductor recombine with electron openings, delivering energy as photons.



**Figure 3:** LED

## 6. Working Procedure

Step 1: Start.

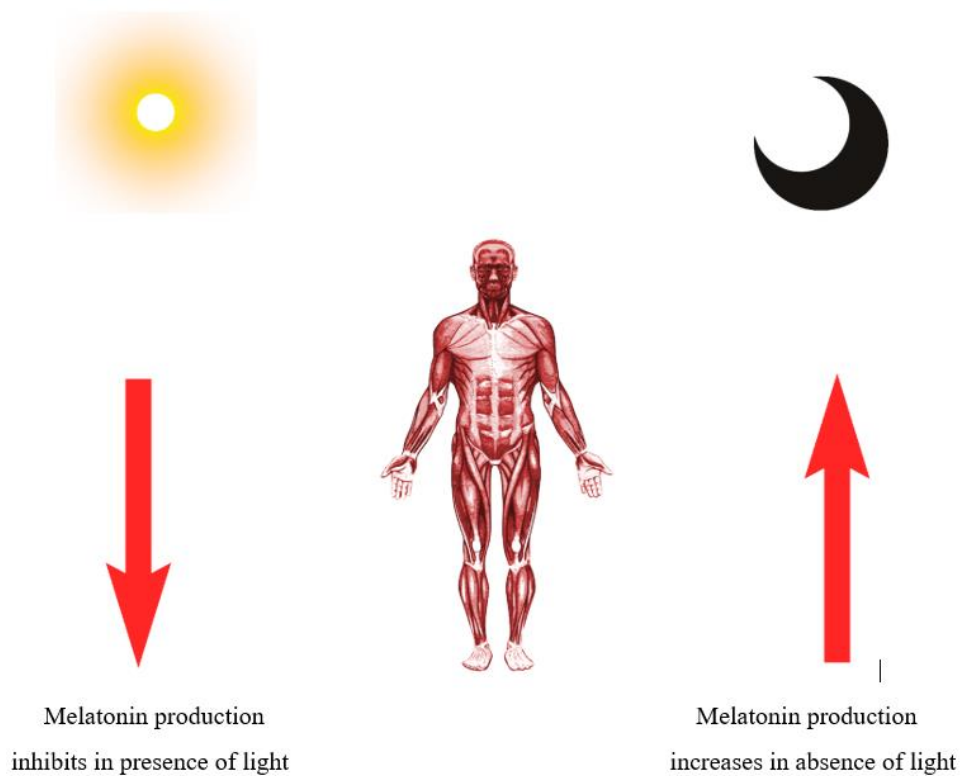
Step 2: Fetch time from the RTC Module.

Step 3: Stimulate Sunrise Via LEDs by slightly brightening the lights.

Step 4: After the full sunrise if user did not wake up then start audio alarm.

Step 5: Manual power off for audio alarm.

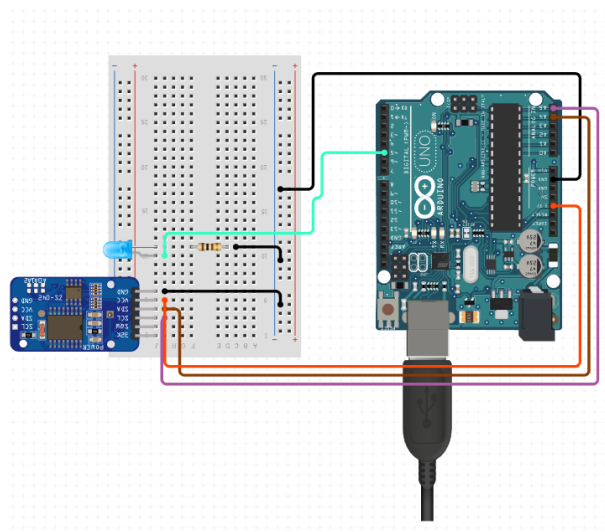
Step 6: Stop.



**Figure 4:** Working of alarm

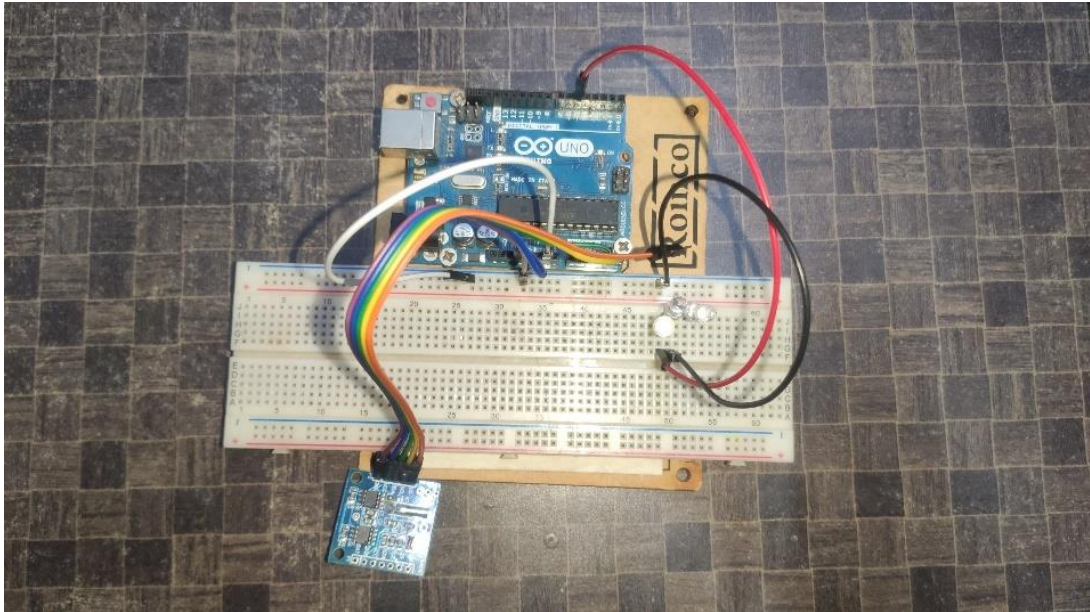
In Fig 4. The working of the alarm is shown, The alarm is set to wake a person at a fixed time slowly. When there is darkness, the human body secretes a hormone called Melatonin which is responsible for feeling sleepy and the gland responsible for secreting this hormone is enigmatic pineal gland which functions in response to the darkness. Melatonin hormone gradually gets released into the stream of blood, reaching different parts of the body, signaling the body to sleep. As soon as the body gets exposed to the light, it stops secreting this hormone that helps you wake up naturally. The proposed system stimulates the sunrise with the help of a pre-coded circuit that will get triggered when the code will receive the time from an RTC, which will be the average time of sunrise.

Fig.5 shows circuit graph of the proposed framework, Fig. 6 represent the state the system is in off state i.e. when the time is past the alarm set time, and Fig. 7 shows the system in on state i.e when the time exceeds the set alarm time.

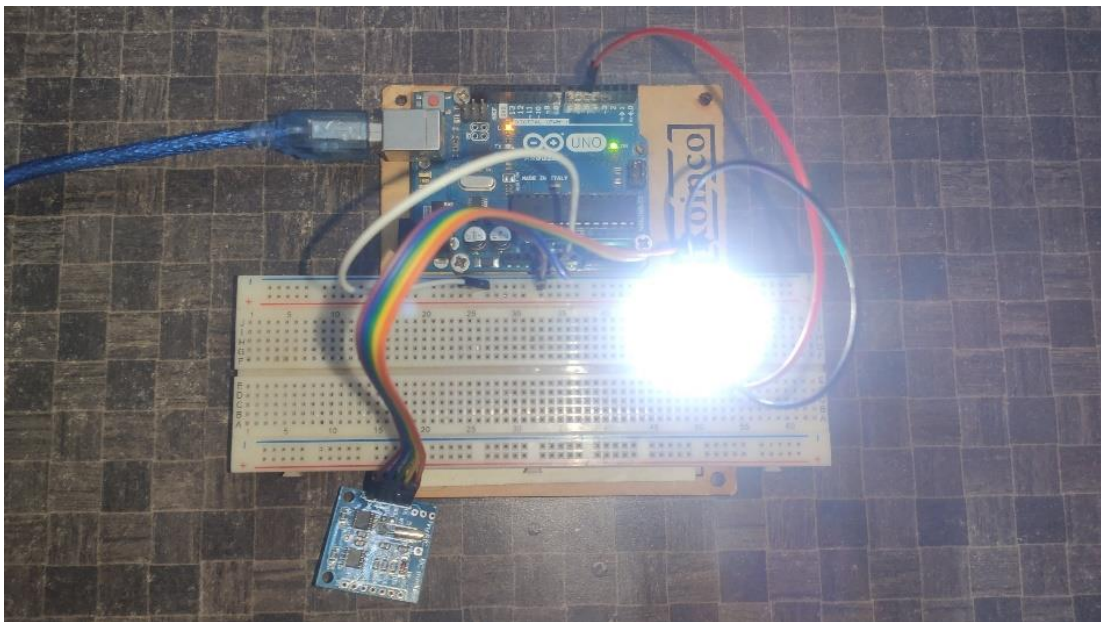




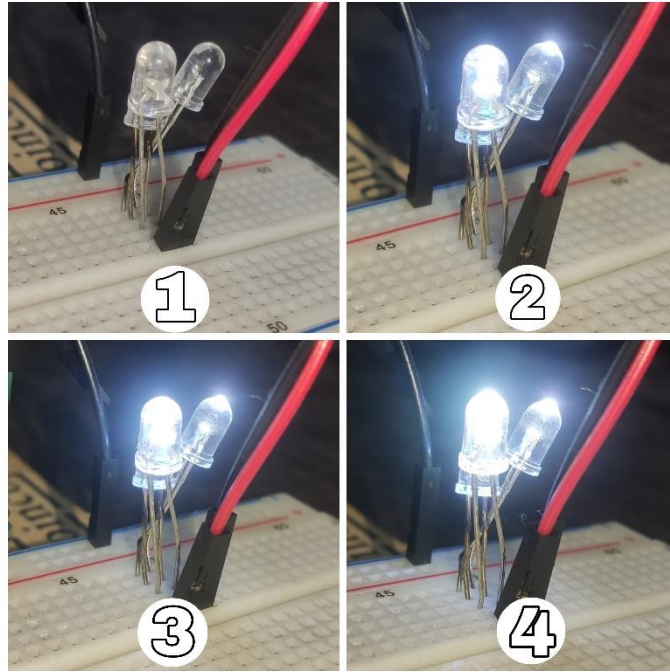
**Figure 5:** Circuit Diagram



**Figure 6:** Off-State System



**Figure 7:** On-State System



**Figure 8:** LED Brightness Level from low to high (Transition from 1 to 4)

In Fig.8 the grid of image shown are the brightness level of the LEDs. When the time hit the alarm time set in the code the led starts at 0 brightness level (1) and the brightness level increases w.r.t to time ((2) to (3) to (4)). This proves the working of the system.



**Figure 9:** System implemented in window

Fig.9 shows how the system will look when implemented in real world using spiral led strip and diffused window sheild.

## 7. Future Scope

For a backup, if the user doesn't wake up at the time, he/she can set an alarm that will be voice-dependent. Also, the lamp will make the sound in accordance with the weather conditions (weather API) in that area. For example, if there is raining outside, the alarm will wake you up with the sound of rain. If the weather is sunny, the sound of birds chirping can be played. This will help the user to develop better sleep patterns.



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