Luminaire: A Bluetooth mesh product

Måns Hofvander
Lund University, Sweden

ABSTRACT

The Bluetooth technology has entered into a new era of mesh technology. Mesh technology makes it possible to control a large network of Bluetooth units over a vast area. This led to the idea of an outdoor lighting network called Luminaire. Luminaire lets the user control the outdoor lighting from a single website and can even be set to track the daylight, with just the click of a button.

1 BLUETOOTH MESH

Bluetooth Mesh is the latest feature added to the existing Bluetooth communication already used today in billions of components. Built on the premise of Bluetooth Low Energy with low power consumption and small Bluetooth units, the mesh functionality provides another dimension to communication. As the name suggests the mesh functionality lets Bluetooth units, called nodes, communicate with each other in the form of a network. Only a single node needs to be within range of a smartphone or a tablet in order for the message to spread to all the nodes in the network. Messages are relayed back and forth from node to node until it reaches its intended receiver.

This network is greatly suited for an outdoor lighting network and with no similar product on the market Luminaire aimed to fill it. Luminaire consists of both a website and a Bluetooth device. The device is connected to regular 230VAC from a standard outlet and connected to the power wires through the hole in the bottom. Small screws are then used to mount the casing to the inside the lamp housing. The light bulb is screwed directly into the Luminaire device which can switch on and off the power to the light bulb on demand. All the nodes in the network can then be controlled by the user from the website. The website has many features, such as setting the lights to turn on when the sun sets and turn off when it rises. From the website the nodes have received information about their location and current time, which is all they need to calculate the position of the sun.

2 CONTROLLING ELECTRONICS

The circuit board is custom designed to fit in a small plastic capsuling. From the board two copper sheets extrude that are part of the 230VAC circuit that powers the light bulb. However the microcontroller with Bluetooth capability runs on only 3.3VDC. This means that the high power voltage entering the circuit board must be stepped down and rectified before it can power the microcontroller and other low voltage components. For this a whole circuit of fuses, capacitors, resistors, diodes and inductors is used together with an off-line switcher. A relay controlled by the microcontroller then decides when the current is allowed to pass through the copper plates and reach the light bulb.

Department of Automatic Control, Based on Masters' thesis Design and implementation of Bluetooth Mesh outdoor lighting ,
2022.

3 PRODUCT GOALS

The purpose of the Luminaire is to provide an easy and accessible way to control outdoor lighting over large areas and large buildings. With the mesh functionality there is no need to draw signal wires or light sensors to the outdoor lights, only power cables are necessary. The network also has another useful feature, the signals do not have to take the shortest path and pass through buildings with poor Bluetooth throughput. They can rather pass around the outside of the building and bypass any obstacle blocking the signal, leaving no node marooned.

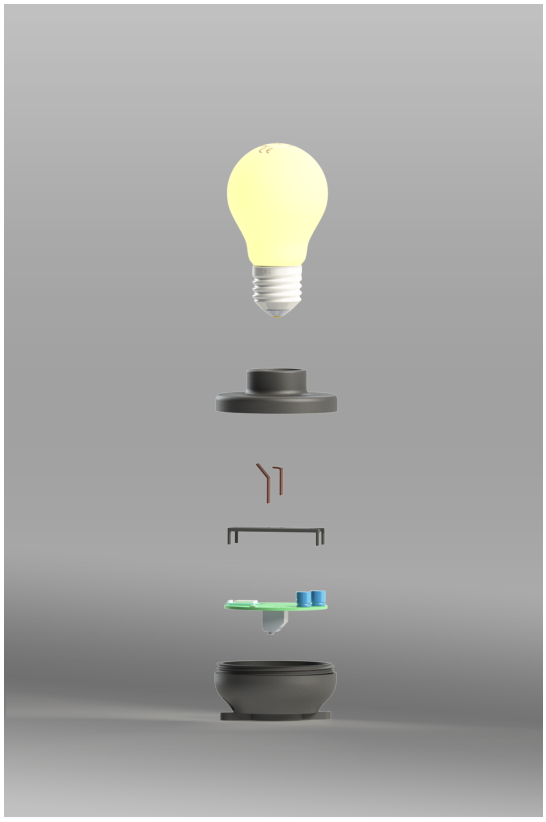

Figure 1: The Luminaire