

# Temperature-based Road Heating Module

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## Objective

The objective of this device is to provide a compact, passive source of heat that clears ice and snow on roads and pathways.

## Methodology

Our team first analysed current solutions used to get rid of snow and ice from roads. It was found that the current solutions either damaged roads or were unreliable and expensive to implement. From there, we tried to investigate potential solutions that we could implement using components that we currently own. Here we looked towards using sparkfun components. Our project aims to be a proof of concept of how roads can get rid of snow and ice.

## Introduction

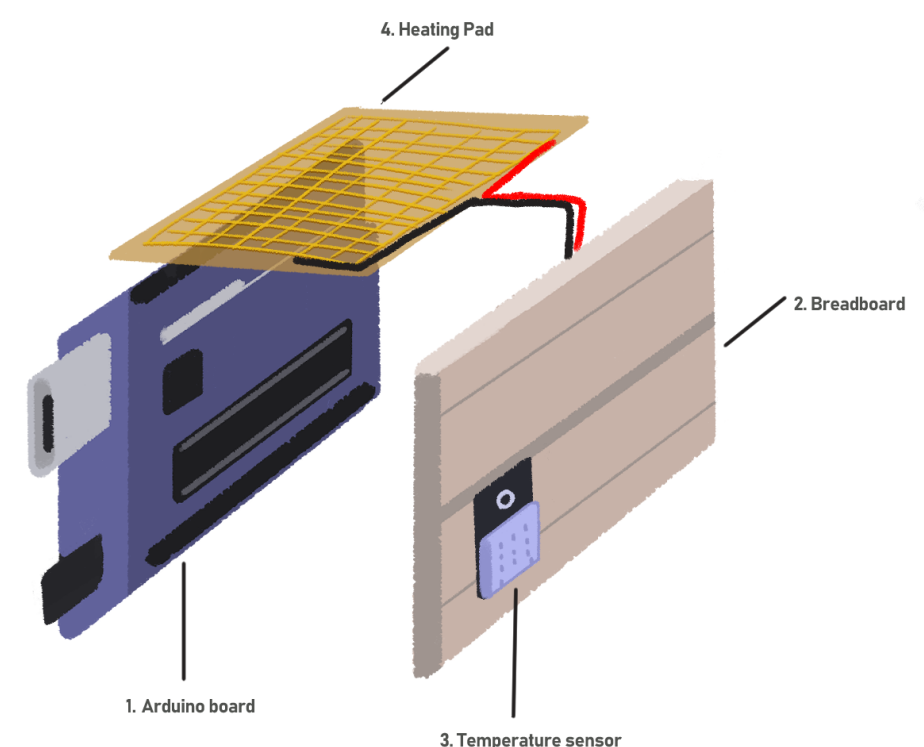
For Northern cities such as Boston, the winter season poses a unique and difficult challenge: winter snowstorms. During snowstorms, ice and snow can easily accumulate on streets and roads, choking out traffic and logistics. Manual methods, such as snowplowing, doesn't work as snow immediately accumulates after plowing, rendering the effort fruitless. Passive heat devices, with their ability to work around the clock, circumvents this problem. Therefore, we designed a heating unit model which can be installed under a section of road, giving around-the-clock snow melting capabilities which would free up once blocked roads during snowstorm season.

## Analysis

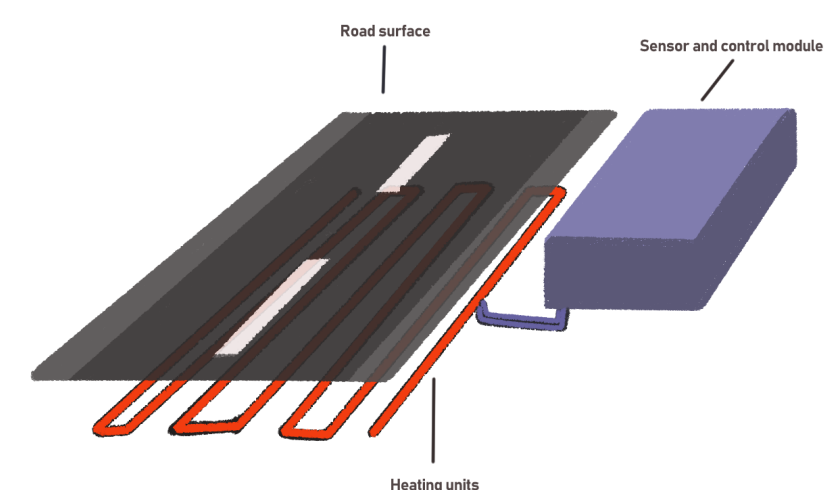
The entire apparatus is built using Sparkfun. Namely, the Arduino uno Redboard. The other components include: four heat pads, a temperature and humidity sensor and 2 red LED's.

The heat pads are soldered to jumper cables that connect to the breadboard. The DHT11 temperature and humidity sensor is also connected to the breadboard and the two LED's are also soldered to jumper cables that connect to the Redboard.

When the temperature and humidity sensor detects a temperature and humidity below a particular threshold, it will send a current to the Redboard which will signal the board to turn on the heatpads and turn on the LED's to indicate that the road ahead is unsafe to drive on



Top: Inside representation of components. Bottom: Real life application of device.



## Results

Our research shows us that snowplowing, while easy to access to, require man power and its rising costs makes it unfeasible both in long term and in heavy storms. Salting, another common method for de-icing roads, is easy to employ on a large scale. However, in colder, heavier snow, brine still freezes, and salting the road runs the risk of corrosion. Passive heating eliminates both manpower need and corrosion risk, only impeded by its limited scale.

## Conclusion

We concluded that using a heating unit to melt the ice during snowstorms are the best and also viable solution, one that is also employed in certain nations, such as Japan.

The enclosure will be made of laser cut wood. and will be an open box. the top of the box will have openings for the all of the soldered jumper cables to come off. the heatpads will be glued onto a sheet of aluminum to ensure that there is equal distribution of thermal energy across the road.

The other side of the sheet will be made of hardened black clay that will be the road. The LED's will stick up to the side of the road and will light up when the temperature threshold is reached. The sensor will also be mounted this way.