

# Geothermal Heat exchanger

Tapping into the geothermal energy of the earth to create a net-zero heating system

Team D3.2

Anmol, Tristan, Liangyi, Rayane, Kate

# Our heat exchanger

- Warm up or cool down the the house during winter and summer
- Zero emission
- Low tech
- Automatically switch from cooling to heating
- Bluetooth Controlled
- Solar Panels follow sunlight





# The intake

Blower fan

Filter

Solar Panels

Arduino

Groundlevel



# The entering pipes

Return air pipe for closed loop system

Intake air pipe for open loop system

The two pipes combine into one



# The heat exchange chamber



(before thermal storage medium (slurry) was added)

# The output



Return air pipe

Sump pump

Air filter

Exiting pipe

Basement wall of home



# What sets our geothermal heat exchanger apart from the rest?

- Rotating solar panels that track the sun to maximize sunlight intake
- Three temperature sensors that control a valve that determines whether the system is a closed loop or an open loop
- The system is bluetooth controlled from your cell phone

# Light tracking solar panels





# Temperature sensors

-3 temperature sensors

-One on the intake

-One in the thermal storage medium

-One in the house

To warm the home, if the...

-Temperature at intake **colder** than temperature of thermal storage medium, system is **closed** loop

-Temperature at intake **warmer** than temperature of thermal storage medium, system is **open** loop

To cool the home, if the...

-Temperature at intake **colder** than temperature of thermal storage medium, system is **open** loop

-Temperature at intake **warmer** than temperature of the thermal storage medium, system is **closed** loop



# Bluetooth system

- Responds to the temperature sensors, has an automatic mode for cooling and for heating
- Controls whether the system is open or closed
  - Closed system: solenoid valve shut and fan off, air taken using return air pipe from inside
  - Open system: solenoid valve open and fan on, air taken at intake from outside





# What just happened?

In the video, the system is at first on automatic heating mode where the fan is on and the valve is open because the intake temperature is warmer than the temperature of the thermal storage medium/heat exchanger. In other words, the system is an open loop. When I put the temperature sensor from the thermal storage medium in hot water, the fan goes off and the valve closes. The system is now a closed loop.

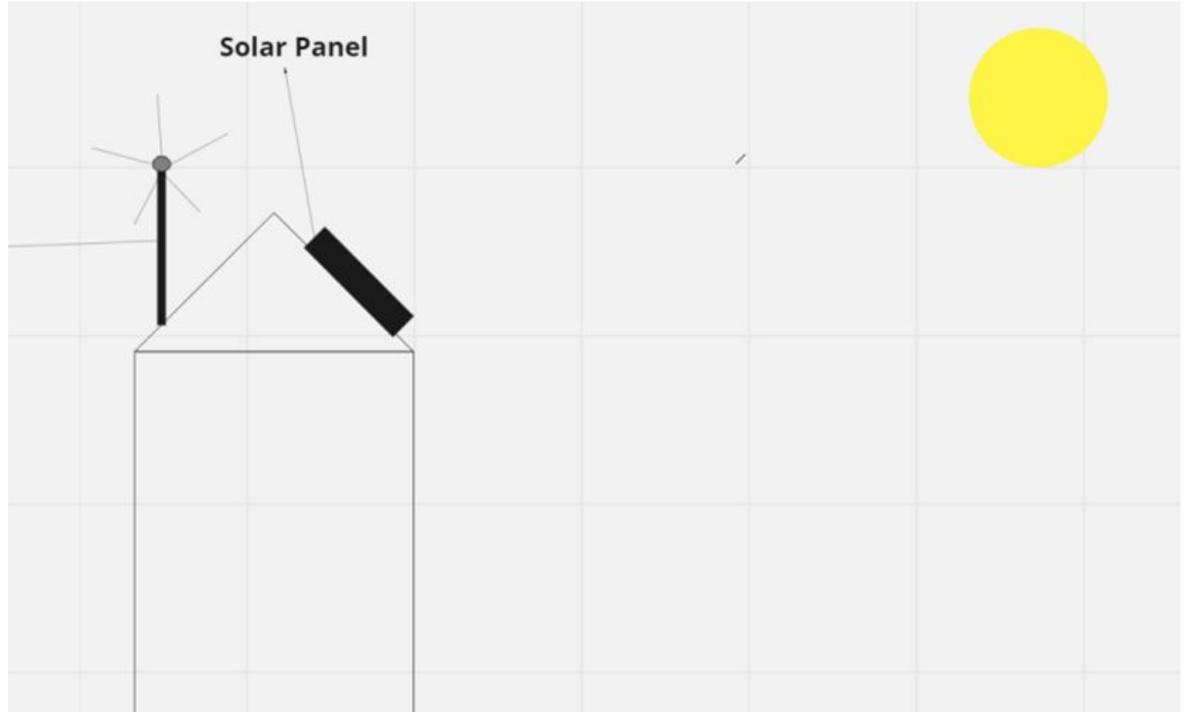
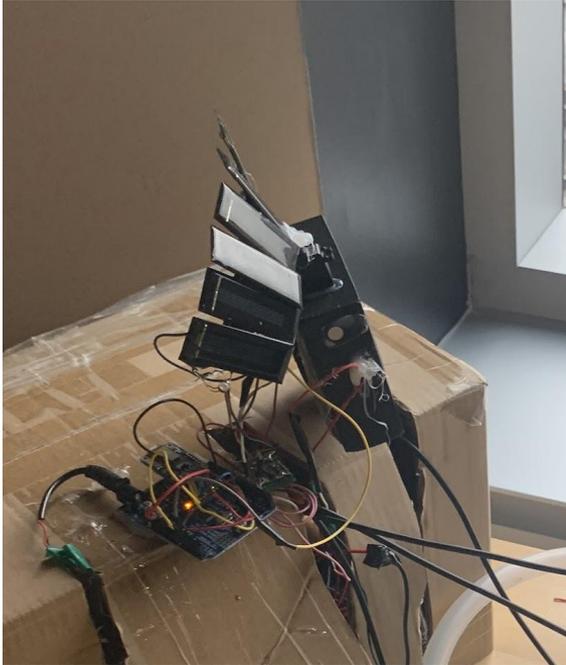
I then use the bluetooth connection from my phone to change the system back to an open loop, and then back to a closed loop before returning it to automatic heating.



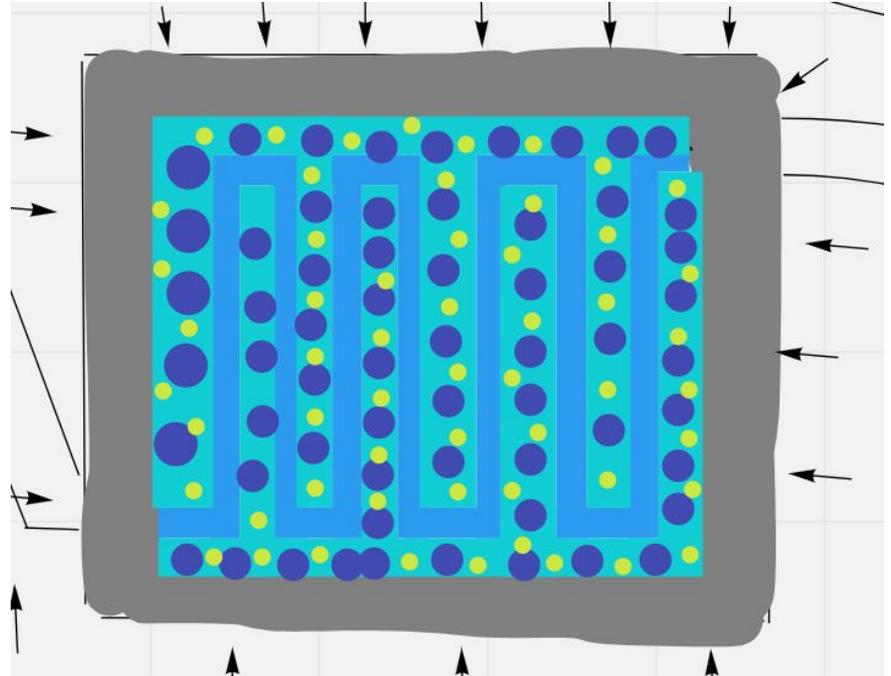
## **Solution options**

1. System with clean electrical power supply
2. Design of the pipe system of the heat exchanger
3. Selection of thermal storage material
4. Placement of the supply fan
5. Air mixing box

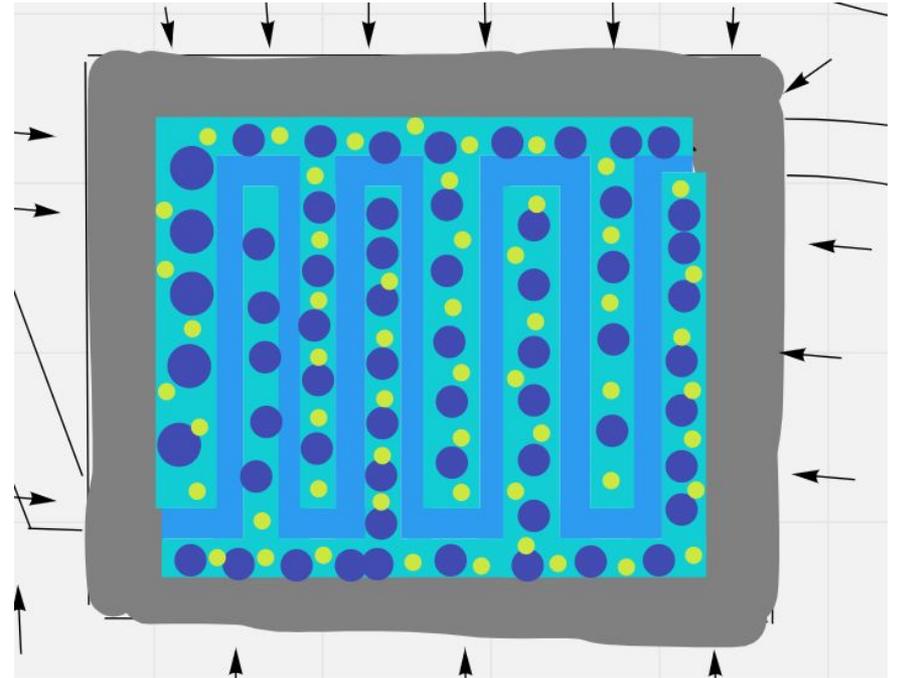
# Option 1: System with clean electrical power supply



## Option 2: Design of the pipe system of the heat exchanger



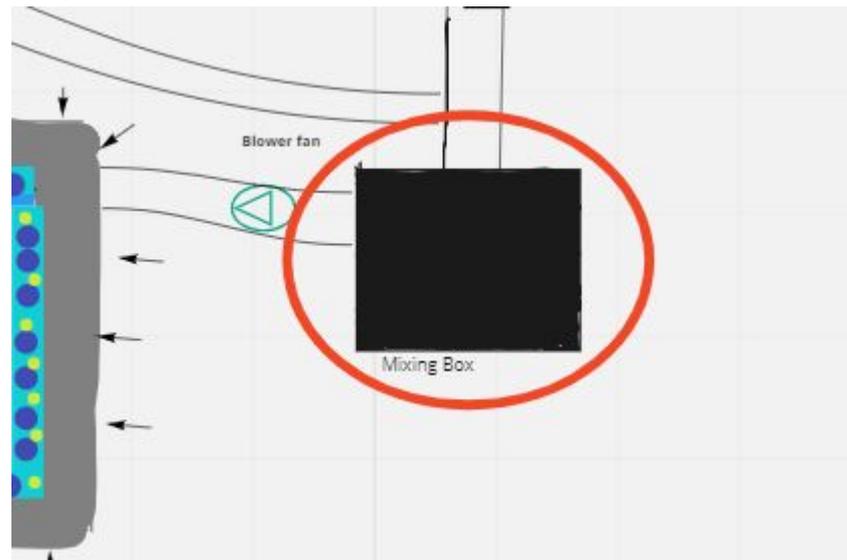
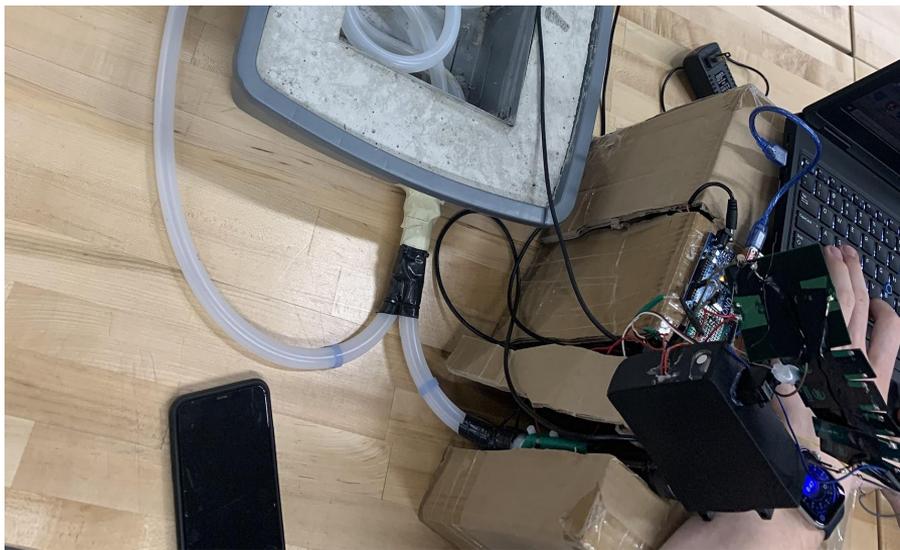
## Option 3: Selection of thermal storage material



## Option 4: Placement of the supply fan



## Option 5: Air mixing box





# **Trials and Tribulations**

- Electrical and bluetooth system
- Cracking concrete
- Maintaining solid air flow through connections
- Combining two pipes into one
- Design day (LJ cameo)



# Lessons learned

- We are happy not to be computer engineers
- Concrete cracks
- Capitalize on one another's strengths
- Arduinos don't have a whole lot of storage
- Epoxy glue takes too long to dry
- Electrical tape is an extremely good sealant
- The Engineering design process works!

**Thank you!**





**Questions?**