

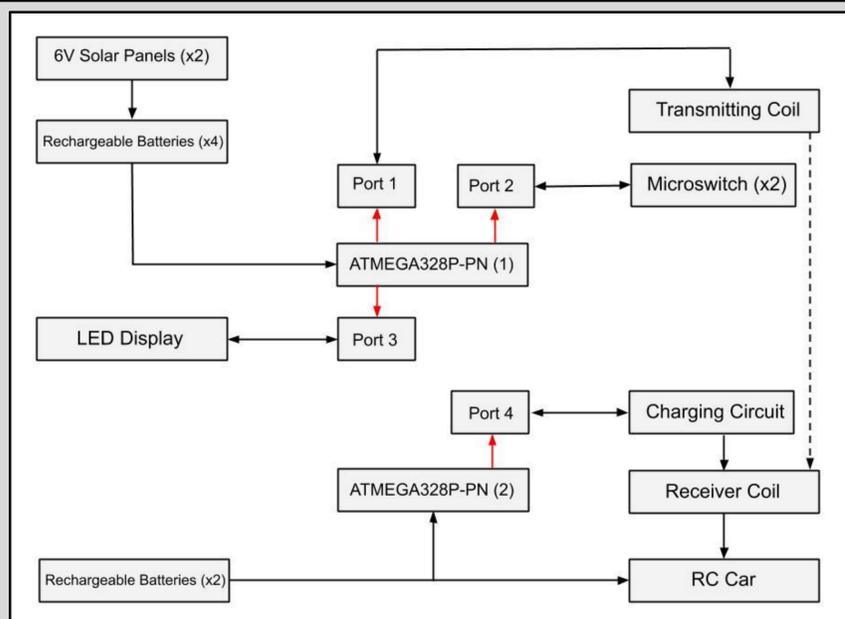
## Background

In a growing market, inductive charging, also known as wireless charging, is being offered for small consumer electronics products such as cell phones, handheld devices and similar devices that charge at power levels below 100 watts. For inductive charging to occur, there must be a transmitter coil, which is located on the platform, along with a receiver coil that is attached on the device to be charged. On the contrary to smart phones and watches, inductive charging products are not as readily available for larger gadgets, like remote controlled vehicles.

## Project Description

The goal of our project is to develop a wireless charging hub with solar power capabilities for a remote-controlled vehicle. The solar panels will provide power to the charging hub's internal battery bank. This battery bank will supply power to a transmitter circuit and a microcontroller, which monitors and controls the receiver's operation. A transmitter coil and charging circuit will be attached to the base of the remote-control car. The receiver circuit will convert the AC signal into a DC supply while the charging circuit safely provides either constant current or constant voltage charging. The type of charging used at any given time depends on a continuous monitoring of the car's battery by the microcontroller.

## System Block Diagram



## The Team



From left to right: Abdulmohsen Alshewaish, Mojtaba Turkmani, Markell Lindley, Nafeis Weixelman and Jared Renard

## Hardware Components



### Solar Panels and Battery Bank

We used two lightweight and durable solar panels that output 12V and 440mAh. We also included a direct connection charging method in case of bad weather. The power supply will be rated at 12V/2500mAh, which will result in charging them in 5.5 hours. The RC's battery pack is rated at 7.4V/3400mAh and charged within 3.5 hours. There will be a total of six batteries, two used for the car and four used in the charging station. Each battery weighs approximately 47.1g so that the RC car doesn't gain extra weight.



### Charging Station

The charging station houses all electrical components and was 3D printed to be lightweight and durable. The RC may drive up the ramp on either end, initiating wireless charging by pressing micro-switches inside tire grooves. The charging output will be displayed onto the LED display. Two solar panels will attach onto the station, south facing, to maximize energy absorption.



### Transmitter and Receiver

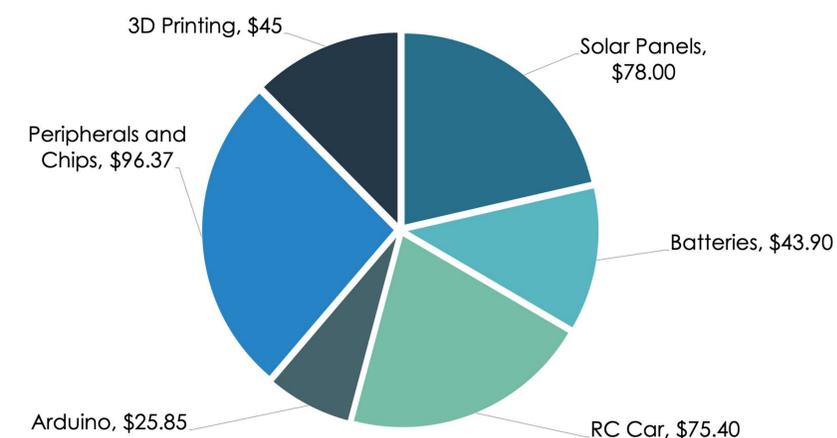
We purchased a set of wireless power transmitter and receiver microchips manufactured by IDT. We chose this pair of chips because of their level of programmability and their ability to transfer the necessary power needed for our system. However, once the chips arrived, we quickly found out that our team would be unable to solder them because of the fine spacing between the pins. We then reached out to the company who let us use their evaluation boards, which already had all the components soldered.



### Microcontroller

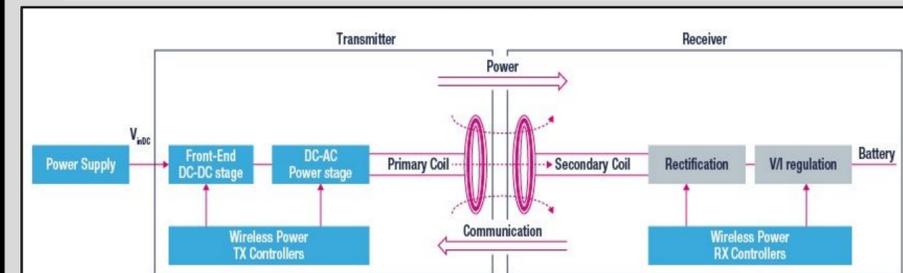
We used two ATMEGA328P-PN chips to handle our system connections. As seen in the system block diagram, these two chips handle all the peripheral communication. We used the I2C interface to read the state of the transmitter, as well as using an LED display to output the charge state of the wireless transfer.

## Budget



The total amount spent on our project is approximately \$365. This includes all parts and material purchased.

## Wireless Circuit Diagram



The circuit design above shows how power can be transferred wirelessly between non-physically connected circuits through induction. Wireless charging is done through a transmitter and receiver circuit. The transmitter circuit is connected to our battery bank, which is charged by the solar panels. The battery bank sends a DC voltage signal into the transmitter circuit, so a DC-AC converter circuit is needed. This AC current causes an oscillating magnetic field to appear, inducing a current in the receiving coil. This AC current is then passed through our receiver chip where it is converted to a stable DC signal at either 9 or 12 Volts at the output. Once the microchips for the transmitter and the receiver circuits arrived, we discovered they were too small to be soldered by our team. We then reached out to IDT and were able to acquire transmitter and receiver evaluation boards, which we have been using to model our system.