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Building Interactive gadgets 207

Assignment 2

1. Explain the relationship between current, voltage and resistance WITHOUT using an equation

(i.e. V=IR)

Voltage is a product of a current flow and a resistance of the all of the components in a circuit. When a current flow or a resistance is increased it is affecting voltage in a direct proportion to the change.

1. What is the total resistance of each of the following circuits (NOTE: Circuit D is extra credit! It's a tough one!!)?
2. In a serial type of connection current is equal trough out the circuit and to calculate a total resistance of circuit we simply add together values of the inline resistors.

R(Total)=R1+R2+R3

R(Total)=220+30+10=260Ohms

1. In a parallel type of connection voltage is equal at the each of the parallel branches.

To calculate total circuit resistance, we should add reciprocals of each resistors and take reciprocal of that sum.

1/R(Total)=1/220 + 1/220=1/2/220=220/2=110Ohms

R(Total)=110Ohms

1. Same rules apply to a segment of hybrid circuit.

R(Total)=R10+1/(1/(R6 + R7) + 1/(R8 + R9))

R(Total)=R10+1/(1/(220 + 220) + 1/(220 + 220))

R(Total)=R10+1(1/440 +1/440)

R(Total)=R10+1/2/440

R(Total)=R10+440/2

R(Total)=220 + 220

R(Total)= 440 Ohms

1. The principle of conservation of electric charge implies that: At any node (junction) in an electrical circuit, the sum of currents flowing into that node is equal to the sum of currents flowing out of that node.

R16 + R15 = R15,16 = 440 Ohms (Because they are connected in a serial)

1. Find three interactive hardware projects that others have done online that you might be Interested in making!

Project candidate 1:

RFID Cat Door

<http://www.instructables.com/id/RFID-cat-door/>

1. A small summary of what was made (1 paragraph)

This project was created to allow a cat or a dog to leave and come back inside a house at any time. Design itself is very simple in its nature. Two solenoids and a hall effect sensor are in charge of a door control. Proximity sensor was used to monitor a pat approaching from the inside and a radio frequency antenna to allow a secure return of our pat. Overall design is simple and effective to carry on with its main function. Controlling access through the pat door.

1. A way you might improve upon their design (1 paragraph).

Main parameter to improve here is the use of a proximity sensor. Using RF antenna to exit and enter would lower the cost and increase reliability of this DIY project. Hall effect sensor is also not obligational in this setup. We could give our cat more time to open and close the door or install an optical encoder. But I like the idea of using a hall effect sensor to make sure the door is in the right position before closing solenoids locks. Additionally, we can attach a food and water dispensary and connect Arduino to the Wi-Fi. So, we can satisfy our pats biological needs remotely or at the prescheduled time intervals.

1. If you think this is a feasible project to do in about a month and a half (because that's all the more time you'll have!)

Yes, it is a very easy project to replicate and I already have some of the components required. Considering my developed programming skills and an overall simple design I would like to conclude that this project has nothing that would slow down development or a build time in any significant way. As I mentioned before we can mount food and water distribution system directly on the door surface. Incorporating water and a food tank directly around the electronics used to control a cat door.

Project candidate 2:

International Space Station Pin ISS Pin

https://learn.adafruit.com/iss-pin/overview

1. A small summary of what was made (1 paragraph)

This project utilizing Particle Photon with Headers and Adafruit Particle/Spark NeoPixel Ring Kit.

Main purpose of this mini project is to track international space station and to alarm owner each time an ISS passes over the head. This hardware components are a very small and a light weight that allowing to build a very interesting wearable microelectronics. IFTTT website connectivity allowing some flexible applets to act as a trigger for a specific action. Luckily Photon's Wi-Fi capability allowing a fast and easy way of connecting to the world’s internet web. Overall this project deserves a second place by the complexity.

1. A way you might improve upon their design (1 paragraph).

I would try attaching a GPS module to this project. Main flaw of this design is that you need to readjust your exact geographical position each time you visit a new country or a city.