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ENGN 3035

Final Project

Electronic Debouncer

Objective:

The objective of this project was to create a noise cancelling debouncing circuit and to test it in multisim and on a breadboard. It is important to debounce and cancel noise in circuits to make the design being affected by the button/switch more accurate and correctly responsive. As if the noise is causing the button to be triggered it could very easily taint or trigger the results.

Method:

Like many electronic problems, there are many ways to go about them, in my case, I simply used a capacitor and 2 resistors to achieve the noise canceling and debouncing circuit.To properly do this project multisim would need to be used, multisim is a computer program where the user can design circuits and visualize graphs derived from circuit they have designed. On multisim, I connected my 3.3 V Direct Current Voltage Source to the top of the circuit in series with my first 11 Kohm resistor. R3 is present to change the discharge rate of the capacitor and to not let the circuit short circuit when the capacitor discharges. When the button is not pressed the current flows through R3 and R4, while charging the capacitor. When the button is pressed the capacitor is then put in parallel with resistor 3 causing it to discharge. This is significant because when the capacitor starts to discharge, something that would normally be picked up on the

oscilloscope such as noise, can not be noticed because it is not significant enough to charge the capacitor. As far as debouncing goes the same happens. Usually when hitting a trigger or button, there would be extra low values that come from the hardware having rather natural bounce. This would make the input look different than what the user was trying to do, for instance, one click could register as 2 or maybe 3 to the output. With the capacitor, if those extra bounces happen there is not enough voltage to fully charge the capacitor then discharge it again since they happen in the micro and nano second range and the capacitor takes around a quarter of a second to charge.

Although this method works for this purpose, short presses would have to be about a quarter of a second because one would need to give the capacitor some time to discharge fully, or to a previously specified voltage. Therefore if one would like to do something as a double press it would take a little bit longer than the normal .2 seconds, up to probably closer to a half a second.

Calculations:

Charge:

$I=(V/R)e^{(-t/RC)}$, $V=Vr+Vc$

$V=IR+(Q/C)$

$I=(dQ/d$

Dicharge:

$Vc= V0$, $Q=CV0$, $I=V0/R$, $Vc=Q/C=I/R$

$Vc=V0e^{(-t/RC)}$

$Q=CV0e^{(-t/RC)}$

$I=(V0/R)e^{(-t/RC)}$