P15001: Feasibility Testing: Distance Sensor Speed

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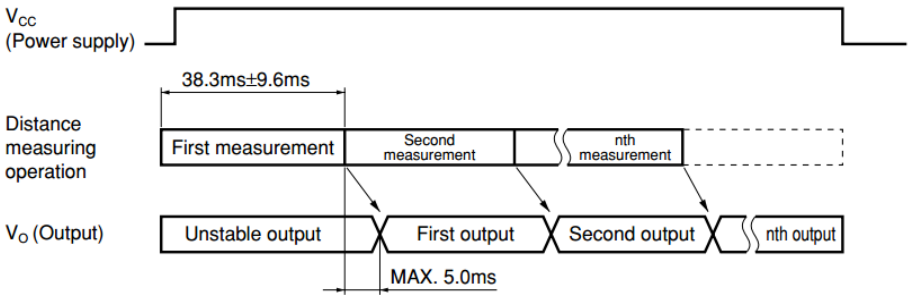
In order to insure that the type of sensor that is currently used in the gait monitoring system is operating fast enough, some worst case calculation should be completed. These calculations are assuming that an ATmega328 microcontroller is used as well as a GP2Y0A0YK IR long distance measuring sensor. Also assumed is that an analog to digital conversion is being used (this would of course be slower than a digital read or an interrupt. These methods may be used in the future but they would be faster, making an ADC read the worst case).

Information from distance sensor (The following timing chart was taken from the GP2Y0A0YK datasheet):



From this information, worst case to first output would be 53ms. This is assuming that operation has stabilized (meaning that power has been applied at least 100ms previously).

From the microcontroller datasheet, ADC characteristics section, conversion time at maximum would be 260 us. For the post processing data, the assembly code FMULS (fractional multiply signed) takes two clock cycles and a compare takes two. Assuming that we are working in C and not assembly, the overhead of the code needs to be taken into account. For direct porting verses a digital write there are 50 cycles to 2. Therefore it is possible to assume that post processing would take 100 cycles. For worst case that number can be doubled. Therefore 200 cycles or 2500 ns for a 16MHz clock.

With all this information. It is reasonable to say that reaction to an object should be well under 100ms or 1/10 of a second. More time may have to be added in the logging is added to the system, but 100ms is a reasonable time frame for pure measurement.

Sources:

http://www.atmel.com/Images/doc8161.pdf

http://www.erasme.org/IMG/gp2y0a02_e.pdf