Re: ultrasonic distance measurement using 89c51

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- *From*: John Fields <jfields@xxxxxxxxxxxxxxxxxxxxx>
- *Date*: Sun, 04 Feb 2007 12:49:01 −0600

On Sun, 04 Feb 2007 16:05:48 GMT, "Jon Slaughter"
<Jon_Slaughter@xxxxxxxxxxx> wrote:

> "John Fields" <jfields@xxxxxxxxxxxxxxxxxxxxx> wrote in message
> news:f9kbs2hk0o3tbsuvu3vgdsr6ojfhk5pte8@xxxxxxxxxx
>
> > On 4 Feb 2007 02:37:14 −0800, "chetanthegreat"
> > <chaudhari.chetan@xxxxxxxxx> wrote:
> >
> > > Hey folks!
> > > I am set out to build an ultrasonic distance
> > > measurement module using 89c51.
> > > The range I hav in my mind is about 1 inch to say 25 inches.
> > > Is the
> > > speed 89c51 offers enough for such kind of ventures?
> >
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> > The velocity of sound in air is about 1100 feet per second, which is
> > about 76 microseconds per inch. That means that for a two−way path
> > of 2 inches you've got 152µs to chop up into slices thin enough to
> > get the resolution you want.
> >
> > Assuming that you're going to use one of the internal timers to do
> > the time measurement, that's going to depend on how fast they can
> > run and the frequency of your clock source. That data should be
> > available
>
> Just to be a little clear(maybe for my own benefit than others) is that
> speed of sound through air is 344 m/s = 13540 in/s. (it doesn't mater how
> far the distance is except for atmospheric effects and such)
>
> Assuming a resolution of x in, one has 13540/x hz. So if you want an
> accuracy of 1 micron = 1/1000 in

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1 micron = 1E−6 meter, not 1E−3 inch
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> then that is 1.35*10^7 or 13 mhz. There is
> going to be a point where its useless to get a faster clock but I have no
> idea what this is.
>
> Thats pretty resonable for the accuracy. Ofcourse I doubt one could get that
> accuracy but maybe.

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If it's pretty reasonable then why do you doubt if anyone could get
it?

If you wanted an accuracy of +/− 0.001" out of 2 inches, that's
+/− 0.05%, which I think is highly unlikely to be attainable since
the air temperature, pressure, and humidity would have to be known
to , say, twice that accuracy in order for the reading to be
believed.

I think something like +/− 5% is achievable, so that comes out to
0.1" for a 2 inch path, which is 7.6µs.

Assuming a hardware counter with enable gated on by the transmitter
and gated off by the receiver, its clock should be running four
times faster than 7.6µs, or 526.316kHz, and for a 25 inch target
would need to be 9 bits wide

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JF
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