12Blocks Application Note:

Intruder Detection System

Contributed by Dennis Shepard

Many years ago, I started Shepard Engineering Concepts & Shepard Creative Lighting. Both firms specialize in embedded control applications utilizing both Microchip Technology & Parallax microcontrollers.

A series of six articles were published in Nuts & Volts magazine between 2000-2002, utilizing Microchip devices programmed in Parallax assembly language. Recently, with the advent of the Propeller & the need for parallel processing applications, I began investigating what software was available that would expedite development & provide enhanced debugging options.

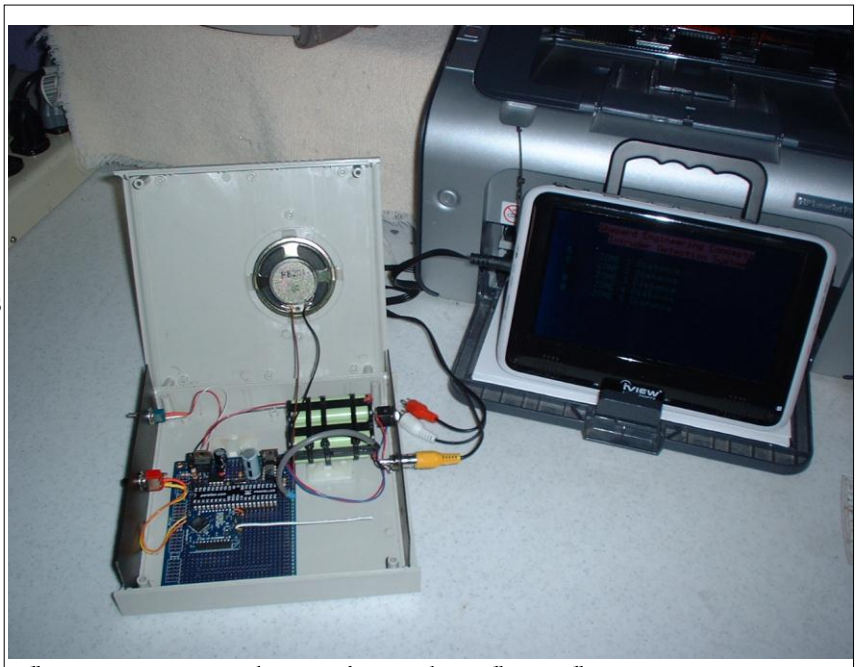

Illustration 1: Dennis' Intruder System featuring the Parallax Propeller

After all, programming is both an art & a science that lends itself to many steep learning curves of unknown duration. That makes it literally impossible to estimate how long it should take to develop an application. And with clients wanting to know "up front" how long it will take & how much it will cost, it's an educated guess at best!

With over 32 years of automation experience (working with Programmable Logic Controllers since 1979), I learned early on that enlisting the expertise of a consultant/developer is the fastest & most cost-effective method of achieving your goal. Searching Parallax's website, I soon discovered Hanno's ViewPort & purchased the Ultimate version.

At the time, I had an immediate application for machine vision features for a proprietary application, which continues to evolve & expand. Being so impressed with all the features of ViewPort, I decided to also install12 Blocks, a graphics based building block approach to programming the Propeller.

Having a 12-year-old son, who's also fascinated by electronics & engineering, I purchased the full-blown version of 12 Blocks to shorten his learning curve for programming. However, what I soon discovered for myself is that this programmer's interface offered everything I needed with incredible options & features. It literally made "child's play" out of an otherwise intellectually challenging process!

Wanting a practical project we both could work on together, I discovered an interesting application using some MaxBotix UT sensors. I had purchased 100 units (@ a respectable discount) directly from the manufacturer several years ago for a feedstock tank gauging system for Foster Farms, a nationwide chicken producer.

The application utilized several sensors in a tank farm networked together on a RS-485 half duplex network, allowing parallel wiring between sensors & terminating to a wireless interface. In the original application, cellular routers linked remote locations hundreds of miles apart.

My new application was for an Intruder Detection System for my home. Like most people nowadays, I try to protect my property from would-be thieves with a security system. And believe me, I've designed with features that nobody could get thru, including multiple sensor technologies, battery backup & video imaging, to name a few.

However, no matter how good your security system is, the bad guys have to "break in" to set off the alarm. My idea was to use UT sensors to monitor that area outside my home. After all, before they can break in they have to get on your property to start with.

Utilizing a Propeller chip, that generates monitor ready composite video (in color, no less), I constructed a 5-channel networked intruder detection system that continuously monitors each sensor twice a second & alarms when a distance threshold is crossed. A latched output drives a Microchip PIC generating an audio alarm. A separate input provides a reset.

Tying the output to a HEXFET switching transistor with a large power supply & high wattage speaker, it's possible to generate hundred's to thousand's of watts of audio power, just in case you feel the need to wake the neighborhood in the middle of the night!

Using 12 Blocks, I was able to easily set up the serial input/output code required to communicate with each node quickly & easily. And having a video output (selectable in 12 Blocks from composite or RGB video) provided an exceptionally easy method to produce & display data.

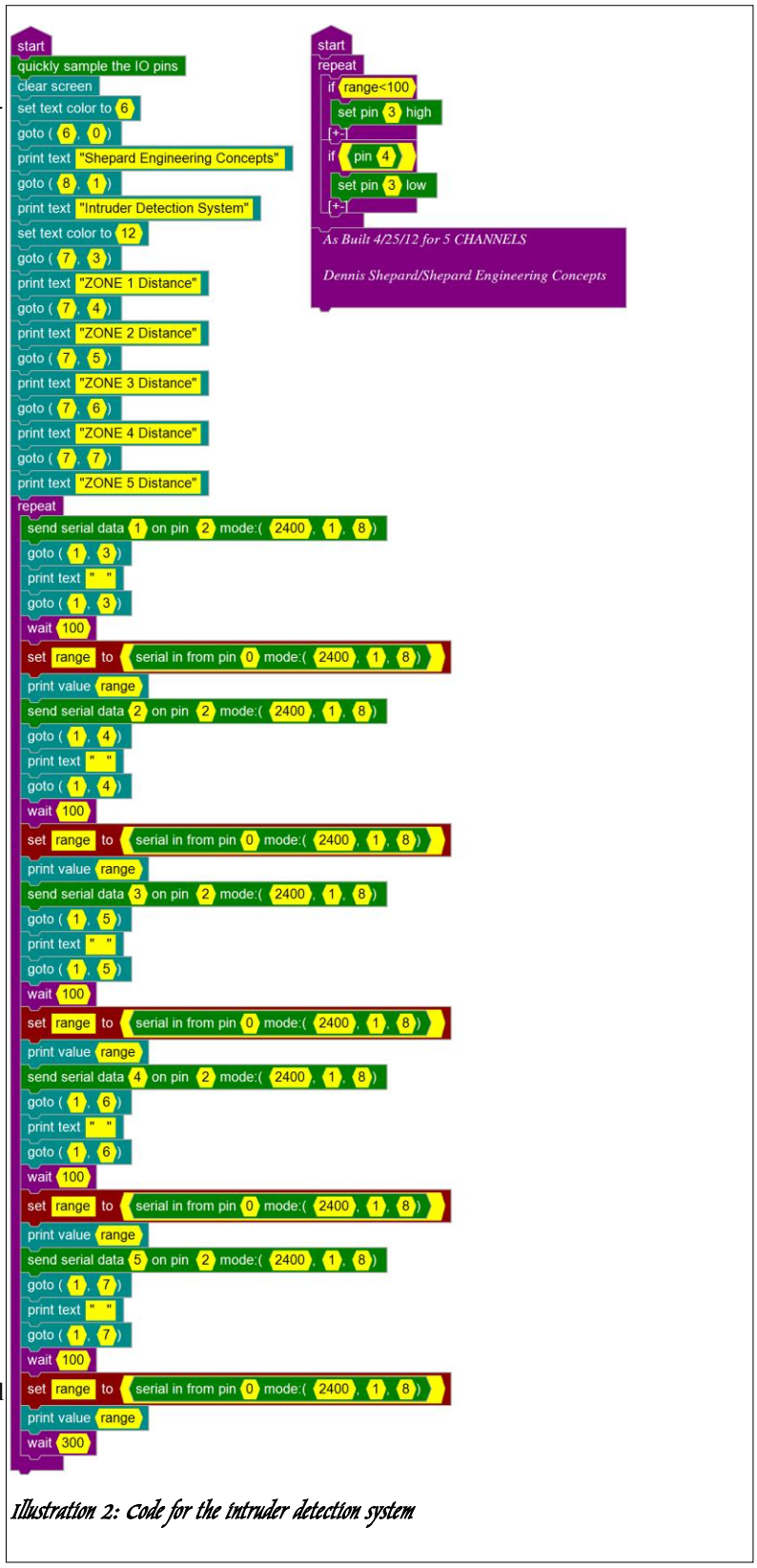

Illustration 2: Code for the intruder detection system

Although I've got a 7" composite display for bedside monitoring, it's just as easy to plug it in to my 27" color TV & display the data there. Using some DIGI wireless radios I already had on hand allowed me to create seamless communications between devices.

This became especially important for field-testing each node for proper sensor placement & alignment. I can literally re-align the angle & direction for each location to give me optimum performance & coverage. And it's a great way to dynamically demonstrate the system to friends & prospective clients.

Since most rooflines are 8-10 feet above the ground, I chose to install some redwood adapter blocks that had been cut diagonally from some 4" x 4" posts ~ 3" long. That provided a 45-degree transverse angle with an adapter bracket, which rotated the enclosure 90 degrees.

The brackets were also mounted to approximate the standard 30-degree roofing slope angle, which provides a 2:1 ratio of range coverage, essentially doubling the range of the mounting elevation. See, all that trig does have some practical applications in the real world!

With devices like the multi-core 32-bit Propeller & the incredible features of both ViewPort & 12 Blocks, the sky is literally the limit. Put these 3 items in your Dream Kit & you'll be able to create anything you can imagine! And, after all, isn't that what engineering is supposed to be all about?

Links:

http://www.parallax.com/propeller/
http://12blocks.com
http://hannoware.com/viewport

For inquiries on this project please contact us here:

http://12blocks.com/about.php