AUGUST 2009 MINUTES

DPRG Monthly Meeting Minutes: August 8 2009

Held at Xmax games, 1931 Skillman

Present: Bruce, Nathan, Bob Cunningham, Jonathan, Ron, Ed Paradis, Jason, Ed Okerson, Dale, Steve Alaniz + son, Steve Rainwater, Martin Meier, John K, Will Knule, Jeff Tregre, Andy (host, Xmax games owner), Scott Sumner

Vistor introduction:

- Jeff Tregre: EE & model builder. Does lectures for professionals who build models, on things like using LEDs to bring models to life, e.g. on trains.
- Jose Quinos: EE, has site for motion control, drivers. Can give a talk on motion control
- Andy (Xmax host) has wifi - buy a drink & use it

Discussion of locations/facilities

- Ron: we don't need dedicated space unless we get some things like FIRST going. Any location will cause some people to be inconvenienced. 30 min travel, close to highway are desirable characteristics of a location
- Ron: mailbox location needs to be canceled to save money (done: mail now being forwarded to Doug Emes residence)
- Steve Rainwater suggested an RBNO at Hanson Robotics (which happened - thank you Steve & David)
- PHP user group meets at Yahoo offices in Richardson
- Dale: meeting once a month in Garland downtown library would be possible
- Question from Ed O: why did we leave the Bill Preist Institute, south of downtown?

Discussion of Contest

- usually held 3rd week of November
- Ron & Ed will be chief coordinators, will delegate
- Ed O: what about an outdoor challenge? Outdoor challenge brings people in; we need to organize getting people in from UTA & UTD & Houston
- Question: would YMCA's have basketball/tennis courts available?
- Proposal: Tanner expo in October. But hard to get enough space at Tanners (want 100' square)
- Thoughts for outside competition: Northway church has a building they're renovating (might be possible to use) -- (we did outdoor contest there 1.5 years ago)
-
- Richardson library & civic center is another possible location for fall contest
- Fen-con is in September 18-20 - Sci-Fi Convention - we will do a table there and some panel discussions Signed up are the following:
    - Ron Grant
    - Steve Rainwater
    - Doug Emes
    - Ed Paridis
    - Dale Wheat
    - Martin Meier
    - Steve Alaniz
    - Vincent Lopresti (space miners -- Moon Dawg)

Show'n'tell

- Jeff Tregre showed his model of the robot from the '98 movie "lost in space". Is interested in building an 8' tall model of it. collecting photos & video & wants leads for materials etc. Looking for a way to laser scan & cNC parts. He will be showing off 4' model of Star Trek Enterprise at FenCon

- Glenn Pipe is hosting R2 builders club.
- Bob Cunningham has welder, pneumatics, etc. Offered use of shop equipment to club members
- Steve Rainwater showed some of his robotic music project parts. He has some inexpensive pusher solenoids planned for use in a xylophone. Planned to be Arduino-compatible
- Will showed his "cow 1"
- Dale announced he'll have another Arduino-building class, possibly at Probotics, in maybe 2 weeks. Contact Dale if you want to participate. Dale is planning more advanced classes (adding sensors etc) then a 3rd phase of putting Arduino's on Robots.
- Ron talked about his microcontroller sleep work. He's using the watchdog to wake the Atmel chip every 8 seconds or so. It draws only 20uA when it's in sleep mode. They will run for a couple of years on a Lithium coin cell.
- Dale just got a $55 FPGA starter kit (Actel). Dale's putting together an introductory course with Jim on FPGA design.

Paul Bouchier
DPRG Secretary

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JULY 2009 MINUTES

DPRG Monthly Meeting minutes 7/11/09

Present: 25 people - near-complete list: Dave Jannke (Probotics America), John Swindle, John Kuhlenschmidt, Brock Marks, Nathan & Bruce Harlan, Steve Rainwater, Glenn Pipe, Ed Paradis, Jason Oliver, Martin Meier + Jennifer, Will Kuhnle, Charlie Youngblood, Jeff Koenig, Rocky, Rick Parker, Jeff Tregre, Bob Cunningham, Ron Grant, Paul Bouchier, Paul Florian

Notes

- Ron recapped the club's use of the WHQ which Mike Dodson had very kindly donated to the club for the last 6 years [turns out 8 years]. Mike has given the club effectively about $25k worth of free rent. The club is greatly indebted to him for his generosity.
- The club needs to skinny down in terms of "stuff". Everything needs to go to a home. Stuff needing to find a home:
    - The big benches need to go to a home (we wouldn't probably see them back).
    - tables & chairs: we want to keep the folding tables/chairs somewhere
    - most computers need to go - we'll hang onto a few
    - Some of the mechanical tools/equipment, & the electronic equipment needs to remain with the club but be stored somewhere
- There's an idea that we could have a "traveling" monthly meeting, maybe at alternating locations every other week
- Dave Jannke (from Probotics) offered a fair amount of spare space at I35 & Walnut Hill for meetings or RBNOs, & has tools which he offered for club use at RBNO. We could maybe have a monthly RBNO there. He has some storage space for stuff that would need to be clearly labeled.
- Paul presented the Roomba work going on in the club. Uses a library from the book "Hacking Roomba" by Tod Kurt. Code download at http://hackingroomba.com/code/
- Jeff showed a kids car axle + motor assembly which he had mounted Northern Hydraulic wheels on. He's using 12V 20Ah batteries which he gets from BG-Micro for $15.
    - Idea: fill the wheels with foam to keep them the same diameter
    - Idea: Use relays in an H-bridge & Fets in the supply to the bridge for speed control - takes fewer FETS
- Ed Okerson showed his mini-balancing robot kit that he brought back from Japan. It has a gyro & accelerometer $100, assembly instructions in Japanese
- Rocky (and Rick) showed MoonDawg, but could not operate it due to battery problems - promised to show at future RBNO/Meeting see http://www.youtube.com/spaceminers

Paul Bouchier
DPRG Secretary

JUNE 2009 MINUTES

DPRG monthly meeting 6/13/09

Present: Jonathan Pitts, Glenn Pipe, Martin Meier, Steve Rainwater, Doug Emes, Steve Alaniz + son, Dale Wheat, Will Schunicht, Bradley Metcalf, Dave Hawkins, Gus, Will Kuhnle, Paul Bouchier, Ron Grant

Minutes

- Club mailbox has been closed down. Mail is now getting forwarded to a UPS drop. Martin just got the PO box address updated with the IRS
- Our club space is going away. Mike is going to try to maintain the current space through the rest of the year, but that may not happen. We'll know more in the next couple of weeks. But eventually, we'll need to think about new space before long. Martin suggested, considering the rate at which we move, we need to think about what to do next.
- Brainstorming about alternatives: Doug suggested we might be able to meet in library or college location. Dale suggested some companies provide hacker space. Dale is going to Houston to talk to some people who are thinking about starting a hacker space there. Tech shop concept might be another option. Dale thinks there are going to be a lot more options for "hacker space" coming up.
- Doug has not ordered Blimpduino yet. Doug has researched Blackfin with controller - $895 with blimp controller. Maker shed is selling Blimpduino for $100.
- Doug & Steve are subscribers on Dorkbot, which conflicts with the monthly meeting, but we should plan on having the regular July meeting at the regular time

Show & Tell

- Glenn showed his Axis 211 camera. It has manual zoom & focus, auto-iris. They run linux inside, & are highly configurable, & have GPIO pins on the back. Can set triggers up for GPIOs
- Dale showed his perimeter defense system. Uses BG-micro sensors that are $10 ea, feeding a arduino which drives a servo to make the pointer track what the sensors are seeing.
- Dale reported on his trip to Maker faire in California. He drove out (2 1/2 days each way), had a table, taught people how to solder tiny cylons, & sold tiny them. The Austin maker faire is up in the air as to whether it will happen. Corporate sponsorships didn't come through last year & they lost money on Austin, so they're not wanting to do it again. Could've easily been 100,000 people at the San Mateo faire. Dale will recruit volunteers (to relieve him at his table) for next year. Nice crowd & very tech savvy crowd - people wanted to reprogram his cylons right then & there. They didn't have robot combat (unlike Austin last year). Paul added some comments to back up Dale from his visit to San Mateo year before
- Ron showed his tiny $70 roving networks wifi->serial module (2mm solderable module)/also through hole .100" pin space model available. There was discussion of alternatives, such as the Lantronix module for $40?, & Fon router for $40. There's apparently also a wifi Arduino shield. Ron has a bird controller with 2 serial ports, so can dedicate 1 to the wifi module. Ron showed a proto (laser cut) for an animatronic puppet armature.
- Ron showed a mechanical module he'd had printed on a Dimension 3-D printer - his brother bought a printer. It uses ABS cord (approx $5/cu"). It takes ~10 mins to print something the size of a thimble. The plastic is quite strong. There was discussion of how much someone would charge for time on such a machine. Thought was maybe $50/hr for printing time. Dale saw a CNC machine (rep-strap) at Maker faire - parts kit for $750.
- Bradley talked about the motion control box that Ron created using Mega-Donkey controller -- which drives things like rotary tables for jewelry photography.
- Steve Alaniz reported on his attempts to make the plotter work. No success yet.

Paul Bouchier
DPRG Secretary

MAY 2009 MINUTES

If you have a copy of this months minutes please email to webmaster@dprg.org. Thanks!

APRIL 2009 MINUTES

DPRG Monthly Meeting Minutes 4/11/09

Present: Ron Grant, Paul Bouchier, John Swindle, Will Kuhnle, Brian Pike, Drew Dolan, Ed Paradis, Glenn Pipe

There was no March meeting - the club attended All-Con instead.

Notes

- Ron showed his audio-output from motor ramp generator, and his robot which lets you play with PID parameters
- Ron described how Doug brought the club $1500 (from Verizon donations), and he asked people to think about whether they would support the idea of approving Doug's desire to guide it's application. Doug is excited about YARB, and would like the club to buy one.
- Ron described YARB (Yet Another Robotic Blimp) - $350 for blimp OR $700 for blimp & blackfin robot + camera (discount from $900)
- There's a Blimpduino - around $100, but doesn't carry much payload
- Paul suggested maybe the club should perhaps auction off the robomower to offset blimp cost. Discussion of need to find out whether the donor is amenable to that kind of use of the donation. We need to get in touch with the donor. Question: what laws or rules apply to who can participate in such an auction. Paul got action to find out from Steve Rainwater who donated it, and what rules apply to any such disposal (e.g. 501c rules etc).
- Ed mentioned Akon - 2 hour presentation
- Ron said Tanner Electronics wants DPRG to do a robot day in October or November - dual purpose - people can shop & support the demo. Tanner has offered to let us show DPRG info on the wall. People liked both of those ideas.
- Ron won't be here next month's meeting, Glenn (Vice-President) is responsible for organizing next month's meeting.
- Will presented a talk on PID (proportional, integral, derivative)

PID AND BEYOND

A presentation on control systems, by Will Kuhnle

[Note: We Expect to Have Will's Slides Published to DPRG.ORG]

- Will handed out notes for the talk, & pointed out: if K & G are large, the output essentially becomes equal to the output, because KG / KG approaches 1
- As an example, the F16 is unstable without feedback control
- Feedback permits greater tolerance on control components G
- The dotted line in the speed/torque graph shows that as load increases speed decreases
- Servos may not compensate for noise in the system - e.g. bumps on the floor
- Will showed his propeller-driven pendulum.The axes of the feedback time delay graph are: X: ms, Y: voltage applied to propeller. He found that thrust is almost linear with current, but speed is not.
- The voltage constant & torque constant are related. The time constant of the motor/propeller is around 50 - 60ms
- Will emphasized the importance of thinking about what you're trying to actually control, when designing a control system. Also, you can't control what you can't measure - be sure you can measure what you're trying to control, and ask is it the right variable to control, to meet your goals?
- You may want to switch what you're controlling over time. E.g. when sending a robot to a target, you may want to control speed for much of the travel, so as not to spin the wheels due to saturated control system, but when the distance becomes less than some value, you may want to switch to controlling distance to the target. Will's list of variables that can be controlled on a 2-wheel driven robot shows the wide range of variables that can be controlled, perhaps at different points in time. It really is important to think about what you want to control.
- Philosophical question from Ed: is there some physical reality to the integral of distance with respect to time? - Unanswered.

- Will showed that a motor that's part of a position servo can be modeled as a mass on a spring, which will oscillate in the absence of friction. The derivative term acts like friction on the mass + spring assembly.
- Will explained why you need the integral term, by using an analogy with 2 tanks of water connected by a pump that pumps water from tank 1 to tank 2. If you're trying to control the level of tank 2, the pump could simply run until the water is at the right level. But now if you start draining water out of tank 2 at a steady rate, there will be an error in the desired level, because the pump won't run until there is an error, and the error will remain, as long as you're draining water out of tank 2. Anytime you have to supply power to hold the desired value, you need integral, otherwise you'll have a constant error.
- On a position servo, you need derivative control, to stop it from oscillating. But on a speed controlled servo, you don't any derivative, because when you get to the desired speed, you can just stop applying power. This is because there's only a single integral in the controlled system - it doesn't have "momentum" that will cause it to tend to overshoot in speed. So it's really important in robotics to know what you're trying to control - if you're controlling speed, you don't need any derivative, but if you're trying to control position, you do.
- Discussion of a bode plot - it's the output of the process (e.g. position of a motor) with the control-loop feedback removed, when the input is driven by a sinusoid. The point where the motor starts to fall behind the input sinusoid is the time constant of the motor - typically ~30 - 60ms for small motors. You need to have a gain of less than 1 at the point where the frequency response on the bode plot drops from flat to the 20dB/octave falloff.
- Servo motors are designed to have a high torque to inertia ration - this is why they tend to be long skinny motors to keep inertia low (because inertia varies as the square of diameter of the rotor).
- When you're changing the amount of integral or derivative you're changing the frequency on the Bode plot at which the response changes.
- New techniques: There's an alternate approach to control systems from PID - the State Space approach. PID is a technician's approach - tune it until it works. State space is a different approach to how you design a servo system. You feed in position, velocity, acceleration, jerk in different amounts. PID is a mere combination of the derivatives. In state space, you have a matrix of variables, but we didn't get a real good explanation of it.
- There's a difference between state space & Kalman filter - in a kalman filter you can't measure all the states, so you come up with a math model of the system. If you have a perfect model, you can get your states out of the model. But your model isn't going to be perfect. So you measure system output & feed it back into the math model as a correction. A Kalman filter is a state space estimator.
- Discussion of types of system. System type is the number of pure integrators in the system: a type 1 system has 1 integrator.

- Ron

MARCH 2009 MINUTES

There was no March, 2009 general meeting. Instead the DPRG made several presentations and demonstrations at All-Con 2009 in Addison, Texas.

FEBRUARY 2009 MINUTES

All, Here are the February Minutes as recorded by Paul and a few follow-on comments by me (Ron).

DPRG Monthly Meeting Minutes 2/14/09

Present: Doug Emes, Ron Grant, Paul Bouchier, Martin Meier, Glenn Pipe, Will Kuhnle, Ed Paradis, Jacob Salassi, Brandon Thomas, John Dolecek, Dick Swan, Dodd Gatsos, Mike Hernandez, and David Martineau

Notes

- Doug presented a check for $750 to DPRG from Verizon Foundation for Doug's volunteer work. Ed took a picture of handing off the check. Club agreed to send a letter of thanks to Doug & Verizon Foundation for their good citizenship & support of the club.
- Dale talked about All-Con. We will have 2 tables. Plan on having as much content. Dale wants to use it to bring new members of the club. We want to put our best foot forward. We will have at least 1 R2D2, an

R2D1.5, a B9. Paul described the activities we'll participate in. Dale explained the 3pi project for All-Con. We have one more opportunity for someone to buy a 3pi and help the club get a free robot. Any volunteers will get at least a set of rechargeable batteries and perhaps more. Dale will have proximity sensors and make them some kind of elementary swarm behavior.

- Please contact Paul or Dale if you can volunteer or want to attend Sunday - they're organizing tickets. We have some number of 3-day passes, and can get 1-day passes.
- Paul presented his paper on calibrating robots for dead-reckoning navigation
- Ron presented his & Will's project of a robot arm that can see a target & currently move a simulated arm to track the target. Goal is to move Will's real robot arm to move the target to a home position.

After the meeting I (Ron) ran my robot "Whip" through one trial run CW and one CCW around a 10' square with X-cw 8" and X-ccw 2" for the trial. Paul crunched the numbers, then unfortunately I applied the wrong sign to my corrected wheel diameter (Encoder ratio correction), and results were about the same on the second"corrected" run (puzzling). I will re-do the calibration and test runs on Tuesday -- also will do multiple runs this time to see how much variance there is in my individual runs.

The test determined my actual wheel base to be 9.069" versus my calculation of 9.198 arrived at using multiple rotations turning in place. Also the test revealed a radius of curvature of 4259" due to Beta angle of +0.76 degrees, which translated into a encoder differential of 1.0022

Paul did a nice job writing a simplified compact "cook-book" form of the procedure described in the Borenstien Paper. Should be very reasonable to code into about 20 lines of C and build right into the robot

- Ron

JANUARY 2009 MINUTES

January 10, 2009

Present: Doug Emes, David Wilson, Martin Meier, Jenn Scarfe, Dale Wheat, Ron Grant, Paul Bouchier, Glenn Pipe, Ed Paradis, David Martineau, Steve Rainwater, Jim Turpin

2009 Elections

Everyone is running unopposed. Martin moved we pass the proposed slate of officers. Seconded Paul. Unanimously approved. This year's club officers are:

- President: Ron Grant
- Vice President: Glenn Pipe
- Secretary: Paul Bouchier
- Treasurer: Martin Meier
- Librarian: Doug Emes

General Business

- Ed Paradis was thanked for his contribution to the club as outgoing secretary

- Discussion of whether the club should support the two First Robotics competitions that the club has been offered participation in (one at UTD Jan 31, another at SMU March 12-14). March conflicts with All-Con

- UTD is the Junior Lego league (ages 7-9). SMU is junior high league - high school level.

- Doug is trying to get Verizon to sponsor him for UTD

- Ron had offered that the club could do a table for a few hours at the competitions

- Martin has done First before in the role of a qualifier. Needs a full 2 1/2 days- There was not a lot of interest in supporting the junior level. Decision: the club will not support the UTD First Competition

- All-Con is March 13, 14, 15

- There's a lot of interest in the club attending All-Con. They were real supportive last year. All-Con has a scientific aspect, as well as the sci-fi aspect.

- Doug proposed that All-Con should be asked to offer a "friend of All-Con" entry level, e.g. gaming-only badge with maybe a $5 entry for competition, & maybe we should hold the semi-annual contest there.

- Martin sent email to All-Con inquiring about participation - they never replied

- It seems too short notice to hold our official contest there - you need at least 60 days notice & we're already at 90 days out.

- Last year the club backed out of Sunday, did Fri/Sat

- Dale will champion the club's All-Con presence. Paul will help.

- All-Con will need names, to get badges. We can do a couple of presentations. Maybe include a competition aspect there.

Discussion of Roborama 2009a

- It can't be done at All-Con (because of lack of prep time, noted above), so maybe we ought to plan on 2nd weekend of May - Sat 9th May

- Competitions will be

1. quick trip (out'n'back).
2. Line following on linoleum tiles
3. square dance.

- Doug & Martin will coordinate Roborama, & set the rules for quick trip and line following.

- Ron will organize & set the rules for the square dance competition

- Doug thinks linoleum floor tiles will work great for line following

- Doug & Glenn will try a Scribbler & 3pi on the floor tiles at next RBNO - if they work ok we'll go with that approach

- Square dance will be similar to Borenstein square, but not demanding 90 degree turns. Time is not a factor - Distance from starting point to end point is what determines winner. Must go around 4 cones on 8' square. We will guarantee a 16' space. Contestants' robots are requested to have the ability to adjust the size of the square.

- Discussion of doing 2 quicktrip runs at once between robots, with an elimination tree. Separate the lanes with dividers and run 2 robots side by side.

- Entry area will be 32" for quicktrip, to support larger bots

- The club needs to purchase a USB keyboard. Martin will pick one up

- Note: Ron needs to check the mail next week - there will be a check in it

- Discussion of eliminating the $180/year PO box, and replacing it with a free physical address. Martin just filed a change of address, so we need to let that filter through the system first. Decision that Ron will renew for 6 months while we look for a free physical address (which needs to be Dallas county for incorporation reasons).

- Steve reported that David Hansen would like to hold an RBNO at his place. People thought that was a good idea. Note: he's got a 3-d printer now, which is cool.

Presentations

Beagle board (http://beagleboard.org)

- Ed showed the Beagle board running the Angstrom distro. (Beagleboard is basically a headless laptop for $150). It has video (S-video + DVI), USB, RS-232, SD Card, MCU has DSP / some graphics acceleration...

- Available from Digikey

- To get started, you need a 5V supply, USB keybd & monitor OR talk to console through RS-232 interface

- Rev C Beagle bd will bring TTL signals out to drive an LCD monitor directly

Molding

- Ron showed his molding work - made a mold of a baby face. Used plaster of paris mold & silicone as the molded material.

- Note: Glenn has done some molding. Possible help for some of Ron's challenges (some of which seem to be related to impatience).

Robot simulation & graphical presentation

- Ron presented his simulation of a robot running the UMBMark (Borenstein square).

- About 150 lines of code created a 3D view of a robot in a 3-d environment with obstacles, running on a grid and doing the square.

- He demonstrated how tiny differences in wheel diameter make significant differences over time in robot course. It was a really cool demo from a graphics perspective

- The simulation & presentation technology is based on OpenGL package (using GLScene see: GLScene.org), & Borland Delphi. It lets you interactively define object positions, camera location, in very few lines of code

- Ron did a quick walk-through the main parts of the code

- Club member David Anderson had pointed us to Borenstein square. Ron related that a key to doing it well is you really need to track your position on a map

- David Wilson presented a bluetooth from PDA enhancement for controlling his robotic dog

- He had been using a PDA with a keyboard, which was painful to drive the dog because of the tiny keys

- The new system is based on a "Basic for Pocket PC" package ($50 from a 1-guy shop in Israel). You can compile Basic on a PC & download it to the Windows Mobile PDA, or download the Basic code & run it interpretively on the robot.

- He's using the PDA's touch-screen to drive the robot (based off the same idea as Glenn using his iphone to drive his R2D2). It sends commands over bluetooth

- Club members had a chance to try driving the dog using the PDA touch-screen UI over bluetooth. Most did not crash it into chairs, walls, etc. Thank you to David for letting all & sundry drive his robot.

Paul Bouchier
DPRG Secretary