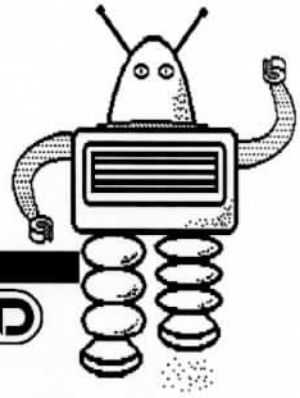

THE ROBOT COMPANION

The Newsletter of the Dallas Personal Robotics Group
November, 1989
Stan Spielbusch, Editor

NOTICES

by Stan Spielbusch

Elections

Only two more months until club elections! Ed has decided to relinquish the Presidency, so we'll get some new blood in here. I will continue to be the editor (which is a voluntary position, not elected), provided everyone else makes it easy on me. I will also run for Treasurer again, since it makes being editor easier. I haven't heard from the Vice President or Secretary yet.

Newsletter Gap

Due to business reasons, there "might" be a delay in December's newsletter. The December meeting time is published in this issue (and has been since January), so there's no reason to miss the meeting. By the way, this does NOT mean that the deadline for articles has changed (still the 1st of the month).

Renewals Approaching

Many members' fees are due in January. Since our membership is growing, I've had to get strict about due dates, so don't delay! If you renew a month early, so I don't have to send you a renewal notice, I'll extend your membership an extra month. By the way, your expiration date is shown on the mailing label.

PRESIDENT'S CORNER

by Ed Rivers, President

On October 13th, I traveled to Denton and made a presentation on behalf of the club to the attendees of Longhorn SOG '89. The talk went well, and my little Hero 1 did his part to make the presentation a success. There was a total of about 15 in attendance, and most were very technically oriented. I was hoping to have a Hero 2000 available, but could not arrange it. After my talk, a presentation was made on computer music. The talk covered music composed by computer, use of the computer as an editing tool, and the use of fractals and neural networks to help compose music. I found it to be quite interesting. The presentation included musical selections pre-recorded on cassette tape.

Our demo for the Garland Girl Scouts was postponed again at the last minute. Have heard no word on when they'd like to reschedule.

The November '89 issue of Radio-Electronics has an article on stepper motors (page 64). They also show how to interface Radio Shack's electronic flux-gate compass to a computer (or robot) via a parallel printer port (page 43).

Recently, attendance has been poor among the long-time members. Because of this, it has been difficult to find consistantly interesting demos for the InfoMart meetings. If you've been away for a while, come and visit us again at the November meeting. If you have been working on something interesting, then bring something to show.

NOTES FROM THE EDITOR

by Stan Spielbusch

First of all, many thanks to Loren Heiny for his article this month. I guess somebody heard my pleas! It looks like he'll be submitting an article for next month, too. Right, Loren? These algorithms that Loren has been providing are very exciting for navigation prospects. The sonar mapping and line recognition could even come in handy for a maze robot (although a little overboard). Anyway, I'd love to see this put to real use for home navigation.

LIMBO

Bob Nansel is continuing his series of articles on LIMBO, the maze robot, in Micro Cornucopia. In the Nov-Dec issue, he provides very detailed plans for the base assembly, including the motor/wheel assembly and a bumper skirt with microswitches. There is also an advertisement offering complete parts kits for the less mechanically oriented, like myself. This would be a great way to get a mouse going! Contact Robotic Systems, P.O. Box 725, Cudahy, WI 53110-0725. Phone (414) 541-8004.

MOVITs

MOVIT kits have shown up in the catalog of Fordham Radio, of all places! For those who aren't familiar with MOVITs, they are small, cute 'robot' kits, primarily for educational use (but then, so was the HERO 2000). For the most part, they are simple-minded machines that react to sound, touch, light, remote or wired control. Some roll, some walk. If nothing else, they're fun. Prices range from $37.50 to $99.95. Contact Fordham Radio, 260 Motor Parkway, Hauppauge, NY 11788-5134. Phone 516-435-8080 or 1-800-645-9518 (out of state).

FINDING LINES IN SONAR DATA

by Loren Heiny

There's no one right way to analyze sonar data. In fact, often the key to success is to carry around a well-stuffed bag of polished techniques from which you can pull when the need arises. In this article we'll explore one technique that you can use to detect lines in sonar data.

Briefly, line finding is the process of fitting line segments to the contour produced by a sonar scan. The line finding implementation presented here is called the iterative end-point algorithm.

Before we get into the details of line finding, a word of caution. Don't get the impression that line finding is the best way of analyzing sonar data. In many cases, I've found it to be overkill. Nonetheless, the technique is definitely one worth keeping in mind -- particularly if you're thinking about matching features in sonar scans or fitting them to a world model. These tasks, however, we'll leave to future articles. For now let's focus on describing how the iterative end-point technique works.

Note that for the purposes of this article we'll assume that we have a set of distances to objects that were gathered by a scanning sonar unit. These points make up what I've called a sonar contour. Our goal is to fit lines to this contour.

The Algorithm

The iterative end-point algorithm is illustrated in Figure 1. The process begins by taking the two end-points of a set of points and connecting them with a line. Then the distances from each point between the end-points and the line are calculated (Figure 1a). Next, the original line is replaced by two lines that connect the end-points and the point that was farthest from the original line (Figure 1b). The algorithm then recursively divides these two line segments as described above until all points for a segment are close to the line, in which case this line is considered a good fit for the data, or the line cannot be broken down any further, meaning no line for that section of data was found (Figure 1c). That's all there is to it.

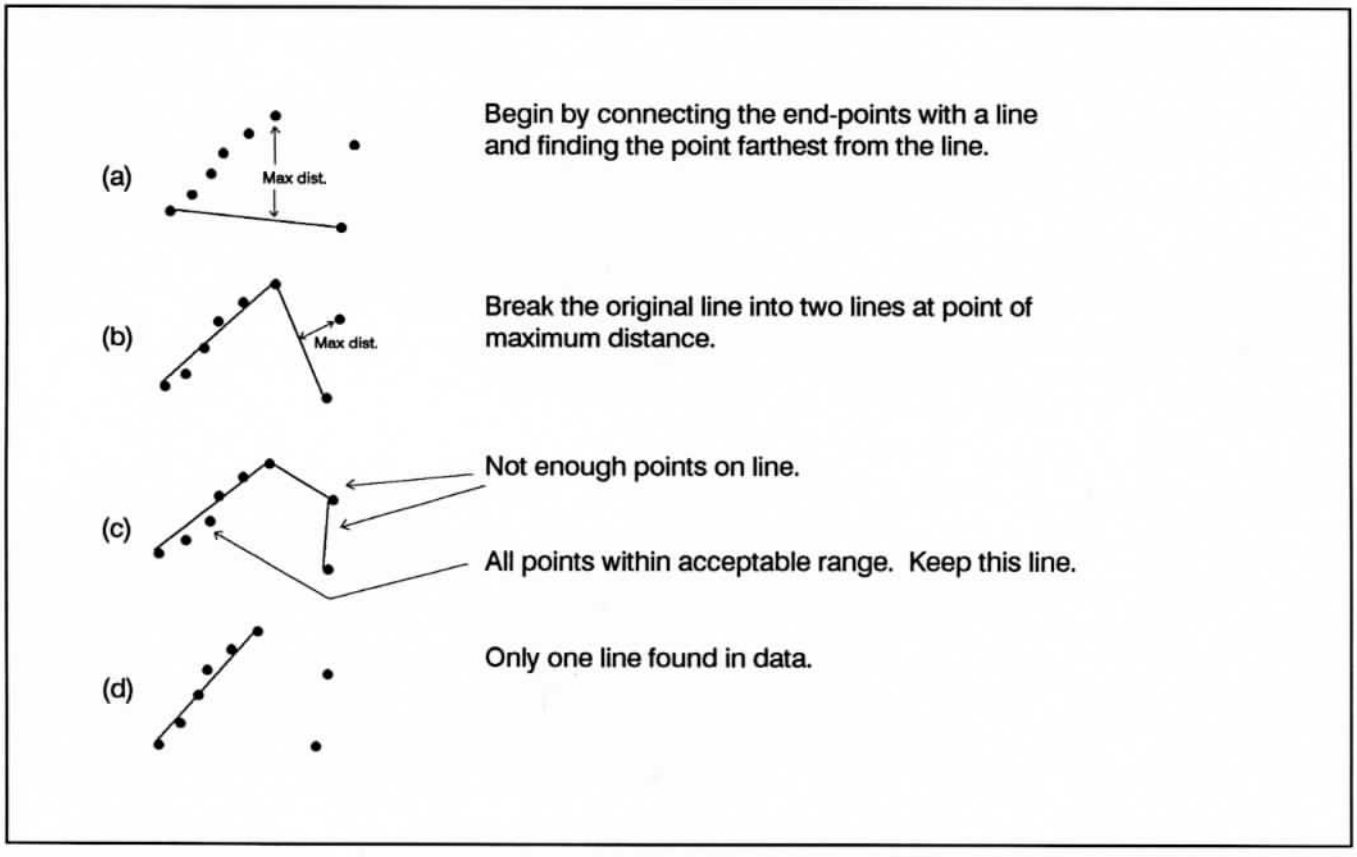

Figure 1. The process of finding lines using the iterative end-point technique.

The only other thing you need to know is how to calculate the distance between the points and a line. Assume we have two end points, p1 and p2, and some point between them, called p3, as shown in Figure 2. We want to find the perpendicular distance from the line segment to the point p3. This is given by the formula:

$$\text{Distance} = \frac{(p2x-p1x)(p3y-p1y) - (p2y-p1y)(p3x-p1x)}{\sqrt{(p2x-p1x)(p2x-p1x) + (p2y-p1y)(p2y-p1y)}}$$

You should not have too much trouble turning this description into code using your favorite language. However, for those who would just like to try out the technique and see what it does, check out SMAP v1.5. (The new version of SMAP has been added to the DPRG library.) It implements the iterative end-point algorithm as described here. SMAP is written in Turbo C and works with sonar data files that come with the program or you can create.

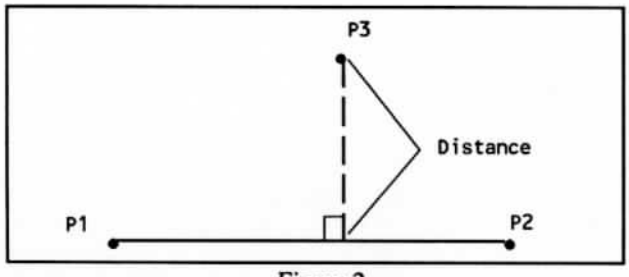

Figure 2.

Nothing's Perfect

The iterative end-point technique is not perfect. One tricky issue is deciding how close all points have to be to a line segment before they are considered to be on the line. If this distance is too large, you'll get line segments that poorly represent the data. Likewise, if this distance is too small, the algorithm may only fit a few lines to the data -- even when it looks like there should be more. This is something you'll want to experiment around with.

In addition, the algorithm as described here can be rather slow -- especially as the number of points increase. For instance, fitting lines to a list of 200 sonar data points can take several seconds. There are ways to speed this up, however, and I'll get into these if anyone is interested.

Where do we go from Here?

One nice feature of this algorithm is that it can be applied to other problems that involve fitting lines to lists of points. For instance, the same algorithm can be used to find lines in video images or tactile data. Of course, we haven't done anything yet with the lines that we've detected. In the next issue of the Robot Companion I'll discuss how you might use this information to find walls in a room or match them to a world model.

CCD Access

by The Journal Group

This month, we continue in the same vein as last: peeking into the doorways of our affiliate members. Here are three more. If you haven't yet dropped in to a meeting of these groups, try it. Consult the CCD Super Saturday directory screens in the INFOMART lobby, and choose something that suits you.

We know people who have been to dozens of events and only attended one group's meetings. It's not a crime, of course. But so many entertaining and educational things go on during any given event, why not look around? For instance, check out what our own snooping sleuths uncovered:

NTPCUG = North Texas Personal Computer Users Group. Our largest group, with over 1200 members, has a bit of everything. Beginning users and seasoned programmers both find welcome and dynamic places to go. Lots of applications-oriented lectures and demonstrations. Vast amounts of information and help for those buying a new system, or those working with an old one. The member-talk on best buys and good contacts are important resources. Heavy emphasis on business applications, especially WP, Database and Accounting, though there are enough special meetings to satisfy home users and MS-DOS developers. Major movement in Office Publishing arena as well. Well-run, never-dull meetings. The sheer volume of communication and activity in NTPCUG generates excitement. Lots of group staff taking good care of users and offering helpful advice. Large Public Domain disk sales catalog.

CIRA = Computer Information Resources Association. While their meeting schedule at Infomart is rather variable, when you do catch them in, you'll be blown away at everything they manage to cover. Once known as the "Chinese Information Resources Association", the group has always had a broad perspective. The name change just makes it official. Whether you are a beginning user or involved in technical pursuits, check out what over fifty members already know: CIRA has members willing to help, educate and discuss computing at any level.

AUNT = Atari Users of North Texas. AUNT, with over 150 Atari folks, supports all Atari computer products. Their emphasis, however, is clearly moving toward the newer 68000-based Atari ST products. It's easy to see why: the ST platform is extremely attractive and affordable considering its high sophistication. AUNT has well-planned presentations. The subjects explored are diverse, often application specific. AUNT members can show you impressive demonstrations in graphics and sound, but wait 'til you see all the members' expertise and interest in serious business applications. AUNT has a good catalog of disks for sale.

We still have ten groups to "tour". As you can see, the CCD is a colorful mosaic of groups. They have differences worth exploring. They have similarities that make the cooperative relationship here at CCD especially valuable.

Any feedback, comments or suggestions should be forwarded to:

CCD Publicity 1950 Stemmons Freeway Box 277 Dallas TX 75207.

CLUB INFORMATION

The Dallas Personal Robotics Group is a non-profit organization of individuals interested in learning about personal robots, sharing ideas, working on projects, and informing the public about the world of personal robotics. We are open to anyone who has an interest in personal robotics, whether or not they currently have a robot, and whether or not they have any knowledge of robotics.

To become a member and receive the newsletter, have access to program library, and be involved in our monthly clubs and user's labs, simply fill out the form below, and send it with $10.00 to Stan Spielbusch, Treasurer (address below).

If you are interested, but not sure you want to be a member, feel free to visit our meetings. If you like, we can send you a sample issue of the newsletter.

Tentative Meeting Schedule (1989)

Nov. 11 Dec. 16

Meeting times and location: 1:30 P.M. at the Dallas Infomart.

Club officers:

President: Ed Rivers	(214) 840-3044	Vice-president:	Brian Vaceluke	(214) 298-2225
Treasurer: Stan Spielbusch	(214) 418-8934	Secretary:	David Ratcliff	(214) 231-9346

Back Issues

Back issues are now available in three sets. Each set is $5.00, plus $2.00 postage and handling if ordering by mail. Set 1: From the formation of the club in 1984 through 1986. Set 2: 1987. Set 3: 1988. Issues from 1989 are $0.50 each, plus $0.25 p&h. Contact Stan Spielbusch, Editor, 2404 Via Barcelona, Carrollton, TX 75006.

MEMBERSHIP APPLICATION

Dallas Personal Robotics Group
c/o Stan Spielbusch 2404 Via Barcelona Carrollton, TX 75006

Check one: ( ) Renewal ( ) New Member ( ) Info Change ( ) Sample issue request

NAME (please print)_____

ADDRESS_____

CITY_____ STATE _____ ZIP_____

HOME PHONE (_____)_____-_____ WORK PHONE (_____) _____-_____

TYPE OF ROBOT (if any) _____

TYPE OF COMPUTER (if any)_____ MODEM: _____ BAUD

Do you want the above information available to other members?_____
(We do not sell our mailing list to businesses, but it is available free to all club members.)