

Adage and Anecdote

Newsletter of the Jisan Research Institute

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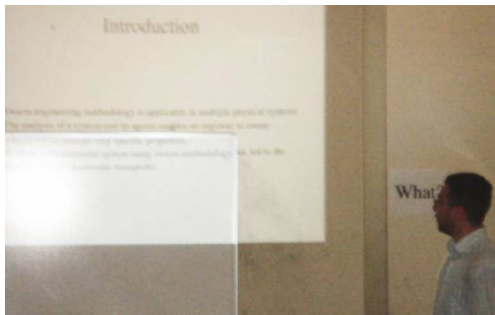
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Presenting JRI Research

On May 20th, 2006, 34 JRI students descended on the Pasadena Branch along with their parents, guests from outside JRI, and JRI student guests from the Fullerton Branch. These students, dressed in uncharacteristically formal clothing, were coming to the Pasadena Branch to present their research to the audience of assembled students, parents, and guests. Although most of the students arrived well in advance of the actual presentations, many of them scrambled around at the last minute, trying to tidy up their presentations and figure out answers to last minute questions they expected from the audience.

This was the third time that students converged on Pasadena as part of a quarterly ritual in which the students reported the results of their activities to their funders – their parents. In years past, one of the major problems concerning students undertaking research at JRI was the fact that they could not communicate well with their parents. As a result, parents often times had no idea what their children were doing in research. This led more than one parent to become frustrated by the process.



Mark Webb begins his presentation in the closed door energy group session.

In order to deal with this problem, JRI began implement a new program whereby parents and students could communicate about the work being done at JRI.

The method began as a poster session during which students would stand near their posters and provide explanations about their research to parents who circulated through the laboratory. This evolved into a conference style "Presentation Day" during which student research groups give twenty-minute-long presentations about their work. The presentations are meant to allow parents to not only hear, in layman's terms, what the research is about, but also to ask questions of their children in a forum that does not allow the children to squirm out of answering!

This Presentation day, the parents were treated to three hours of presentations held between the hours of 1:00 p.m. and 4:00 p.m. The presentations, involving 34 students, occurred in two parallel sessions, moderated by JRI students Mark Webb and Hamik Mukelyan, JRI's second and third ever candidates for Level 5 status. Mark and Hamik were in charge of making sure that the presentations were approximately on time (even their own!) and that each speaker was given the opportunity to answer questions about their talks. While the presentations themselves started somewhat later than initially expected, the sessions .



Parents and students watch Jonathan Lee and David Zitter (not shown) give their presentation.

(see Presentation Day on p. 4)

Research Notes

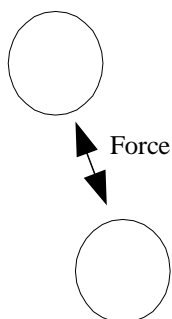
Artificial Physics

by Kelsey Lau

Artificial Physics. What is it exactly? How does it relate to work at JRI? These are probably a couple of the many questions you may have when you hear the words, “Artificial Physics.”

In essence, artificial physics is the application of natural physics laws to the spatial control over collections of mobile artificial agents. The laws we use are force laws, and the ultimate result is to distribute the artificial agents in such a way that they create geometric formations.

In nature, objects are governed by natural force laws, particularly the law of gravitational force. We can apply these laws to artificial physics by generating algorithms that cause artificial particles to behave as if they are being governed by natural forces (pictured below).

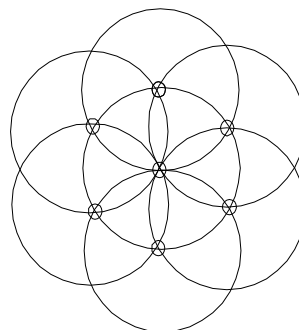


As a result of using artificial physics, we are able to create systems of agents that, through simple interactions, are able to generate complex results. For instance, by creating agents that move in circles and that are able to sense their proximity to nearby agents, we can create a complex hexagonal lattice with simply applying the gravitational force law of physics. Thus, the particles travel according to the paths pictured below.

After ample time has passed, the particles will ultimately complete their formation of a hexagonal lattice.

When applying artificial physics, it is not uncommon for an external disturbance to occur that alters the progress that the agents make. When the agents are unable to fix the problem using local control, global control is needed. This global control uses a global observer that is able to communicate with, but

not necessarily see, the agents.



However, we find no use for this global control aspect of artificial physics – we wish to create artificial physics systems in such a way that agents are capable of achieving global goals by themselves. If a disturbance occurs, agents should be able to rectify the problem locally.

Now, why exactly do we use artificial physics? This discipline can be applied to the spatial distribution of many objects in real life, objects that range from nanobots to micro-air vehicles (MAVs) to satellites. By using the simple interactions among agents involved in artificial physics, complex results, the formations of geometric shapes, can arise.

As demonstrated through artificial physics, the use of individual agents to accomplish a goal that the agents themselves would not be capable of accomplishing sounds awfully similar to the purpose of creating swarms. That similarity is precisely what we would like to explore.

In our research, we ultimately would like to apply swarm concepts to the concept of artificial physics. However, in looking ahead, this goal may be a bit restricted by the limitations of artificial physics, the fact that only force laws may be used in creating geometric shapes among agents.

Nonetheless, we'll continue working towards finding a new relationship between swarms and artificial physics!

Comments from the President

by Sanza Kazadi

It's a gorgeous day today in Southern California. The sun is shining, there's a light breeze, and the temperature is nearing the low seventies. If I crafted the day and the environment by hand, I couldn't have

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Comments, contd. From p. 2

designed a more perfect day. I have half a mind to go for a walk rather than work, perhaps dragging my students with me, as this day is nearly too perfect to pass up, even in Southern California.

This is perhaps one of the last opportunities that I will have to write before our outgoing Seniors scatter for the summer and then pack up and relocate to school. Over the past several years I've had the opportunity to meet and get to know them. As I think about the different people who have graced JRI's labs, I have to say that I'm both pleased to have known them and confident that they will perform well in their careers and lives. However, before they all rush out the door, I have a few things to say. These comments are directed at our outgoing seniors.

Firstly, I know that most of you young students are anxious to get out of your parents' house. To be finally on your own, with all that it entails (making your own decisions, deciding when to go to bed, hanging out with friends all night long), must seem very exciting. For you, college is a time that means that you will grow, have a great adventure, learn things, meet friends, meet yourself in a new way, and decide the kind of life you will live. However, before you all go off and have the adventure of a lifetime, take a moment to remember that you are all students, and that college is there for a purpose that far exceeds the latest homework set, fraternity party, late night study session, or midterm exam.

Why is it that you have worked so hard to get to this point? What is it that your parents and community expect from you that you should expect from yourself. Well, we all expect you to put facts in your head. That's part of the learning that we definitely want you to do while you're away at school.

Aside from this, however, we want you to decide what kind of life you want to live and to pursue it. That is to say, much of the direction your life will take will be decided in the next few years. Will you get a graduate or medical degree or not? What kind of job and subsequent career can you expect? What station in life do you expect to find yourself in? Will you devote your life to service or live privately. Will you become a leader? Know that whether you actively choose it or not, these decisions will be made for you in the next several years. Be aware of what you want, and take steps to make it happen.

I have told all of you that you are mankind's first, last, and best defense against ignorance and against the kinds of problems that will affect the world in the next few years and decades. Remember as you go to school that you go to turn yourself into a weapon to be wielded

by the corporations, laboratories, universities, governments, and the communities of Earth. Don't lose sight of this. You are there because of the great sacrifices of your parents and your community, and you go to not only better your own life, but those around you.

Do not forget your great responsibility. Remember that this will be the generation that must face the realities of a changing environment and dwindling supply of resources. You are not immune to the things happening here. You must push yourselves forward and strive toward the greatness we have seen within each of you. I know you will make us proud if you try. I hope that you do.

Alumni Notes

The Random Walk by Henry Lin

Being a fourth year graduate student reminds me of the time I spend at JRI during my senior year in high school, where the emphasis is more on the experience rather than simply completing the work required for the degree. Throughout high school and college, the mentality of most students is to complete the necessary course work in order to obtain a diploma and move on to the next stage; however, in the world of research, there is rarely a project with such a well defined straight route. Rather, most projects consist of a guided random walk that slowly progresses without necessarily an end goal. Through the random walk one gains valuable experience and mental toughness that prepare them to tackle the next problem in real life, which itself often does not have a straight forward solution.

I begin my first steps of random walk/research experience at JRI by working with a mentor, Dr. Kazadi or Sanza during his pursuit for his Ph.D. ten (10) years ago, to perform a mini project and progress to tackling real life problems in a team setting. This was particularly good preparation in light of the fact that the notion of working in a team setting has become more important as I progress in my studies. Expertise from a wide range of disciplines such as chemistry, medicine, engineering and statistics are needed in my current work. Working in a team not only requires the wits and knowledge of the collective group but also a knowledge of the proper respect, communication and interaction mechanisms within the team. Such exposure to scientific teamwork is best introduced at a young age where students can freely express their thoughts with proper guidance instead of having to learn how to be a team player later in life when the learning environment

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Random, cont. from p. 3

may be tainted with politics and seniority that will hinder and discourage the learning process.

The idea of working on a problem without a known solution is both fascinating and frustrating. I am sure each student at JRI in the research groups can share their own personal story of how frustrating research can be; however, the bitterness of frustration and time commitment often leads to the sweetness of a successful experiment or derivation leading to a new understanding or product. It is very likely that some students find the process of discovery or problem solving to be so frustrating that it outweighs the feeling of accomplishments in the end. JRI is the perfect place for a young scientist to discover if they fall into such category. After all, not all JRI alumni are in the field of scientific research. There is, however, one common skill that each JRI student will walk away with from the program, which is learning the method of how to tackle and eventually solve a scientific problem.

I started my random walk at JRI and I am walking towards my next stop, which is obtaining my Ph.D. in the field of cancer nanotechnology. For those of you that are in the initial steps of the walk, remember not to rush and run, but rather to experience and learn during the walk, keeping your chin up even if the days are long and gloomy. For those that have completed the walk, I hope to interact with you in the near future and maybe hear your voice through this column.

Presentation Day, continued from p. 1.

managed to keep to the expected schedule in most cases

Students discussed a number of different topics relating to their research. Three different research groups – the evolutionary computation group, the swarm engineering group, and the energy group – presented the current state of their research. While the evolutionary computation group is winding down at JRI, it is going out with a bang – three papers presented this summer in the GECCO 2006 Conference. All three groups' work was presented, giving the students a valuable opportunity to practice their upcoming talks. The swarm engineering group, which had nineteen students gave talks ranging from the physical construction of their robots to simulation work done on wall-building algorithms to economics with a swarm twist. This, the new focus of the JRI Pasadena Branch, was the most diverse of the groups. The energy group gave presentations about the state of their work in a closed session attended by the student participants' parents and the other students themselves.

Most parents in attendance agreed that the event was a valuable opportunity to see their students' work. While the technical details of the presentations often times needed work – one of the rooms was WAY too crowded while the other was very empty – most parents agreed that they were able to get a better idea of what their children were doing, or at least were impressed that their children completely confused them during their presentations.

The next Presentation Day is scheduled to be held in September. Since the research students will be working through the summer, parents can expect to see significant change in their children's progress.

What's Goin' On

One of the ways in which people in the JRI community can keep in touch is by talking about what's going on in their lives. Many JRI alumni and community members have gone on to other places, professions, schools, etc. The adventures you have had and the stories you have to tell are not only part of your history, but they're interesting to many of your friends and colleagues that you've gone away from and maybe lost touch with.

This column, is dedicated to keeping people in touch with one another by giving them a forum for telling other JRI students a bit about what's going on in their lives. If you have a story to tell, please consider writing it down and forwarding it to us so that we can include it in this column. It might be a humorous anecdote, a shocking event, or an important moment in your life. It can be a long story or just a few paragraphs. Send one in right away if you have something to share.

Remember that the best way to keep in touch is to let others know what's going on in your life. Let us help you to do this!

The First JRI Alumna to Get Married!

S. Kazadi

A little while ago, I got an email from a former student, one of the first that ever came through JRI. We've been keeping in regular contact since she left. During that time, I have come to think of her as more than a student, though she still has a bit of work before she is a colleague. I have no doubt she'll make it.

Yan Qi, one of the first students to go through JRI has had several firsts at JRI. She is the first JRI student to have gone through college at Caltech. She is

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Goin' on, cont. from p.4

the first JRI student to go to graduate school at Harvard. These are both impressive and exciting accomplishments. I am expecting a long string of them from her; no doubt some of them would be JRI firsts. However, I was not expecting the next first.

On April 14th, 2006, Yan Qi and Lang Lin were married at the County Courthouse in Los Angeles. I was very honored to be one of the few guests to attend the ceremony. The small gathering that followed consisted of a lot of talking, getting to know one another, and laughing. Nobody in the party drank, however, which didn't seem to make the gathering any less enjoyable for anyone. A much larger and more formal ceremony is planned for sometime next year (the exact date has yet to be set) in China. I expect to be able to attend the event; this should also double as a fun vacation during which Yan's father has promised he will give me a tour of the Great Wall of China. I will be sure to include pictures for everyone to enjoy.

To Yan and Lang, I wish you all the best as you start your new life together. I know that your lives will be full of professional success and fulfillment. However, I wish you also the harmony and peace that a happy marriage can bring. Make sure that you support each other, and that each one of your hopes and dreams become the other's hopes and dreams, as important to you as to the other. Never stop laughing, and never stop pushing each other to achieve and to become the best people that you can be.



JRI Classifieds

Got stuff to sell? Put them in JRI's newsletter and let your JRI community members get the first crack at

See Classifieds, p. 6

JRI's Second Patent

On the JRI website, we reported a an invention by Dr. Sanza Kazadi known as an *epsilon axle*, which was provisionally patented by Dr. Kazadi on March 1st 2006. The technology was developed under Dr. Kazadi's guidance by Ms. Debby Chung who constructed the first prototype using JRI's machining equipment. This was seen as a large step forward in JRI's history – a step involving the creation of a new technology that could have literally thousands of uses from floating windmills to levitating trains. However, even though this achievement is significant, the road ahead is far from smooth.

Several years ago, during the years of 2000 and 2001, JRI formed a collaboration with a scientist named Mr. Shaheen Hoque who worked with Raytheon Missile Systems in Arizona. Mr. Hoque had an idea for an image recognition system that was based on chaos theory, which would utilize fractal forms to generate a signature that would be unique under rotation, translation, and other transformations for images. A research group consisting of alumni Angel Li, Willie Chen, and Elvio Sadun was formed to investigate this system. While the original idea proved not to be viable, a secondary system based on nonlinear dynamics of a complex system was designed which demonstrate image recognition. The group not only published their results in the 2001 International Computer Vision Symposium, but also put in a provisional patent for the technology.

The road from a provisional patent to a money-making product is a long one, and the initial effort proved to require too many resources to generate a product. The patent eventually expired. With this second patent, the challenge is to not only create products based on this technology that will be commercially viable, but also to generate enough funding to complete the worldwide patent before the provisional patent expires.

Kazadi and Chung are optimistic about the prospect for this technology in the future. "There are lots of products that can be developed from this technology. Some of them are so simple, that it's next to trivial to begin making them. Some are complex and are several years out. The trick is to use the simple ones to generate funding that is required to build the complex ones. I think we can do this." says Kazadi.

Tables, Courtesy of the Zitter Family

Unknown to most of the JRI community is the fact the Carol Zitter, mother of JRI senior David Zitter

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Zitters, cont. from p.5

is a master craftsman. Her work around her own home is astounding. So it came as little surprise to some that when David wanted to come up with a project which would allow him to earn his Eagle Scout rating, David chose a project that put his parents' and his own skills to the test.

David's idea for his Eagle Scout project was to replace the tables in two of JRI's computer laboratories with brand new tables that would hold multiple computers, saving space and improving the overall environment in the lab. In order to do this, he discussed the project with his troop leader, had the project approved, and set about thinking about how to accomplish the goal. David and his parents Marty and Carol all worked out a plan whereby they could build tables by hand which would be equivalent to tables that otherwise could cost more than \$15,000 apiece. David was able to get the lumber for the tables from Davis Lumber as a donation, arrange to have some of his fellow scouts come and help him with the tables, and set aside time during his spring vacation to build the tables. After two weeks of building, David, his parents, and his friends completed the four tables worth an estimated grand total of \$60,000.00 if purchased in a retail store. Over the next three weeks, David and his father moved the four tables to JRI and assembled them.

JRI would like to thank David, his parents, Davis Lumber, and the scouts that helped David for their generous donation of materials, time, and effort. The tables have changed the laboratories they are in, making the laboratories more spacious, neat, and pleasant. We expect that these tables will provide students at JRI with a wonderful working environment for years to come!

Classifieds, cont. from p. 5

them. Sell your items to JRI students from coast to coast. All you need to do is email the listing (and possibly a photo) to office@jisan.org, and the listing will be included in the next issue, as space allows. If you find an item on this list that you would like, email office@jisan.org to contact the seller.

2004 Acura TSX - \$24,000.00

Black interior/exterior, leather, AM/FM w/ six disk in-dash CD changer, air conditioning w/ dual zone control, power sunroof, cruise control, 16.5 K miles, very good condition, original owner, still under warranty.

YOUR AD HERE!

Come, on, you know you want to sell something...



David Zitter's tables comfortably fit five students each, opening up the room and providing for a more relaxed working environment.

Calendar of Events for Pasadena

June 2006

10 Bio-Energy Project-12-3 pm
11 Water Pump 11-2 pm
18 Father's Day- Open
19- 25 No Research
26 Summer Research Schedule begins

July 2006

1 Bio-Energy 12-3 pm
2 Water Pump 11-2 pm
4 Fourth of July (closed)
10-12 No Research- Dr. Kazadi at GECCO 2006 conference
15 Bio-Energy 12-3 pm
16 Water Pump 11-2 pm
29 Bio-Energy 12-3 pm
30 Water Pump 11-2 pm

August 2006

11 Bio-Energy 12-3 pm
12 Water Pump 11-2 pm
18 Last day of Summer Research Schedule
21-4 September-No Research
5 September- Research resumes
Graduation Date to be announced

Calendar of Events for Fullerton

June 2006

10 Crystal Radio Project 5-8 pm
19-25 No Research
30 Summer Research Schedule Begins

July 2006

1 Crystal Radio Project-5-8 pm
4 Fourth of July (closed)
15 Crystal Radio 5-8 pm
29 Crystal Radio 5-8 pm

August 2006

11 Crystal Radio Project 5-8 pm
20 Last day of Summer Research
21-4 September No Research
5 September-Research resumes