Video: Evolutionary Robots Learn to Crawl Before They Walk

And they're stronger as a result. Just like babies!

By Dan Nosowitz   Posted 01.24.2011 at 5:45 pm
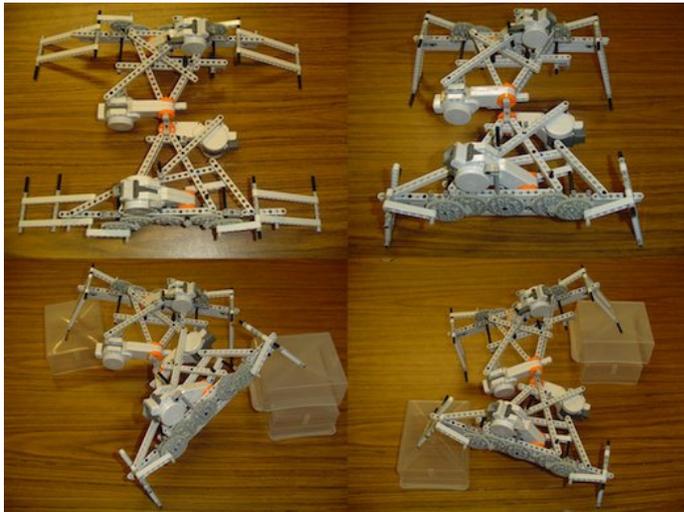
The Robot, Evolving *University of Vermont*

At the University of Vermont, roboticist Josh Bongard decided to take a page from organic evolution's book in the course of his research. Humans and amphibians, among others, move through stages before they move as they will in adulthood, whether it's a baby crawling or a tadpole swimming--why not a robot? Bongard's 'bots learn to crawl, then stagger, then walk upright--and are more efficient as a result.

Bongard built a genetic algorithm and put his virtual robot brains through five thousand simulations. That algorithm causes the virtual robot (represented in a three-dimensional space as a four-legged creature with a jointed spine) to experiment with different forms of movement, with the eventual aim of getting to a light without falling over. Mostly, the robots try three different forms of movement: crawling (like a snake or tadpole), skulking with splayed legs (like a lizard), or walking upright (like a four-legged mammal).

But the aim was to study the robots that move through those forms of motion, evolving from snake-like writhing to dog-like walking. Bongard says "the snake and reptilian robots are, in essence, training wheels," allowing the robots to find motion patterns with a minimum of risk. After they've got the hang of forward momentum, figuring out balance to walk upright is no sweat.

As it turns out, those robots that began as crawlers and moved through the other stages of movement ended up much more steady and efficient than those thrust into upright walking from the beginning. That evolution prepared the robots for challenges even beyond merely walking--they responded much more effectively to impediments like, um, being poked with a stick (seriously). The evolved 'bots were able to remain upright while their non-evolved siblings toppled over.

Eventually, Bongard built a simple model out of a few Lego Mindstorms kits to test his findings in the real world. You can see in the video above that the robots learn to crawl, then scuttle, then walk, just as in the simulations. It might be a simple proof of concept, but it is incredibly promising: Aside from all the end-of-days terror that an adaptable robot naturally invites, that sort of mind would also have incredible uses in fields ranging from medicine to the military to construction.

[**UVM** via **SmartPlanet**]

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10 COMMENTS

ghost

01/24/11 at 5:56 pm

that is kinda eery, i like it!

Link to this comment

xalar

01/24/11 at 6:46 pm
They should modify the algorithm to simulate more human like bodies. Seriously, a problem that many androids have today is that they have to be stable.

Link to this comment

IceMetalPunk

01/24/11 at 7:00 pm
I'm sorry, but why is this news? Haven't we been using evolutionary programming for robot learning for many years now? It seems like he just applied it to MindStorms...not a major leap forward, to be completely honest...

-IMP ;) :)

Link to this comment

nimpkish

01/24/11 at 8:00 pm
@IMP

Because it's cool. It's probably news to a lot of people. It's got a video. Meaning, it's got moving colours and sounds.

Link to this comment

-my name here-

01/24/11 at 8:24 pm
are those legos?

Link to this comment

mikehobbs25

01/24/11 at 10:25 pm
Wow these look really cool.

Make it a great day

Mike
http://whoismikehobbs.com

Link to this comment

trtp2

01/25/11 at 9:57 am
News Flash!!!!!! This isn't evolution of anything! Why is it that scientists or people in general want to tag the word evolution onto everything they can?

This is learning through programing and adaptive antilogarithms. The Robots aren't evolving. Like a human baby it learns to do things over time.

Link to this comment

patron

01/25/11 at 11:01 am
News Flash!!!
Evolution: a process of gradual, peaceful, progressive change or development
IE Learning. Learning is evolution. You happen to be thinking of the biological definition of evolution, but there are so many more. You could say that school alows you to evolve from a child to an adult. Or, according to the context you are using, fish evolving into amphibians and reptiles.

Link to this comment

trtp2

01/25/11 at 11:56 am
@patron - I don't think the word Evolution fits what these robots do. Though some aspects of the definition do "fit", the progressive change part. But I don't usually think of learning as evolution. If I learn how to sing a song, I didn't evolve, I merely learned a new pattern of words. Did I evolve into a singer? No I learned to sing a song.

Merriam Webster Definition of LEARNING
1 the act or experience of one that learns
2 knowledge or skill acquired by instruction or study
3 modification of a behavioral tendency by experience (as exposure to conditioning)

Clearly the change is brought about by purposeful actions and programing.

Link to this comment

Slunk

01/25/11 at 12:46 pm
@trtp2 - No u did not learn to be a singer after learning/singing a new song, but u took the first steps. If you learned more songs after that im sure u would gradualy become a better singer just like these robots who learn to walk by repetition. Evolution is a gradual process, rome wasnt built in one day so to speak.

and dont try to correct the definition of evolution by throughing a different definition at us... lol

Link to this comment

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