Think Artificial

Fastest Biped Robot in the World

- Posted by Hrafn
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Today's robots are too slow. Here's a hypothetical recap of what's going on in my mind when I'm watching some humanoid robots: "Yes, yes … you're moving the leg… still moving the leg… wow! Totally awesome maneuver over that threshold!". Given some time, that tends to get boring quite quickly. Well, thankfully technology advances and robots get faster: Runbot is a small robot that walks only slightly slower than humans.
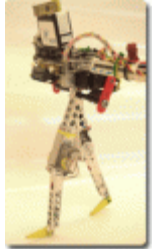
> The basic walking steps of Runbot, which has been built by scientists co-operating across Europe, are controlled by reflex information received by peripheral sensors on the joints and feet of the robot, as well as an accelerometer which monitors the pitch of the machine.

> These sensors pass data on to local neural loops - the equivalent of local circuits - which analyse the information and make adjustments to the gait of the robot in real time. [BBC]

I've written about Dexter before, a robot that uses similar real-time adjustments of its gait as opposed to Zero Moment Point (ZMP) algorithms, who generally work only work on refining gaits within preconfigured constraints that keep the robot balanced. A consequence of using ZMP is that the robots, well, they tend to walk like robots rather than humans.

Here's a quick video showing Runbot going through the painstaking process of learning to walk on different terrain (see the last video link below for an example of how fast he can go).


Professor Woergoetter, of the University of Gottingen, in Germany — one of the scientists working on Runbot explains the architecture of

Runbot in the interview:

> "Passive walking looks pretty realistic - but that's level one. On top of this we have local circuits, nested neural loops, which operate between the muscles (the joints of the robot) and the spinal cord (the spinal reflex of Runbot)."

Basically, Runbot's architecture is split into three levels of control (multi-leveled control is not uncommon within the world of AI): Postural reflex, Spinal Reflex and Biomechanical Reflex. A detailed description of the system can be found on RunBot's project page, but in short each level handles different kinds of events, ranging from small to drastic. Drastic being — for example — a complete change in surface you are walking on (see ramp-walking (MPEG).
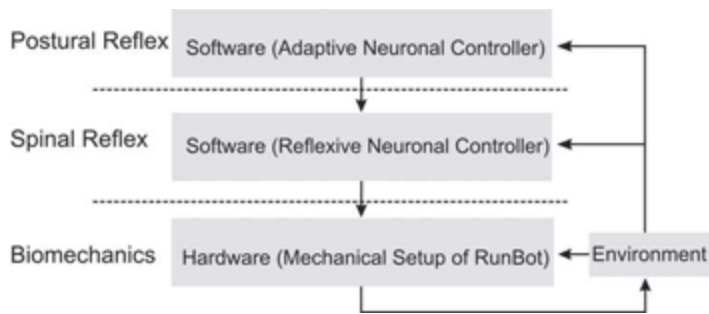
By dynamically adjusting posture and motor positions via input from sensors, the robot balances and adapts in realtime to terrain changes. A video of the robot walking, and adjusting its speed on the fly, can be seen here (MPEG). Very impressive how fast it walks (warms my heart).

Links & References

- BBC's Article "Robot unravels mystery of walking"
- One of Runbot's Project Pages
- Adaptive, Fast Walking in a Biped Robot under Neuronal Control and Learning. 2007 Publication on Runbot. (PDF)
- Image Credit: Poramate Manoonpong

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