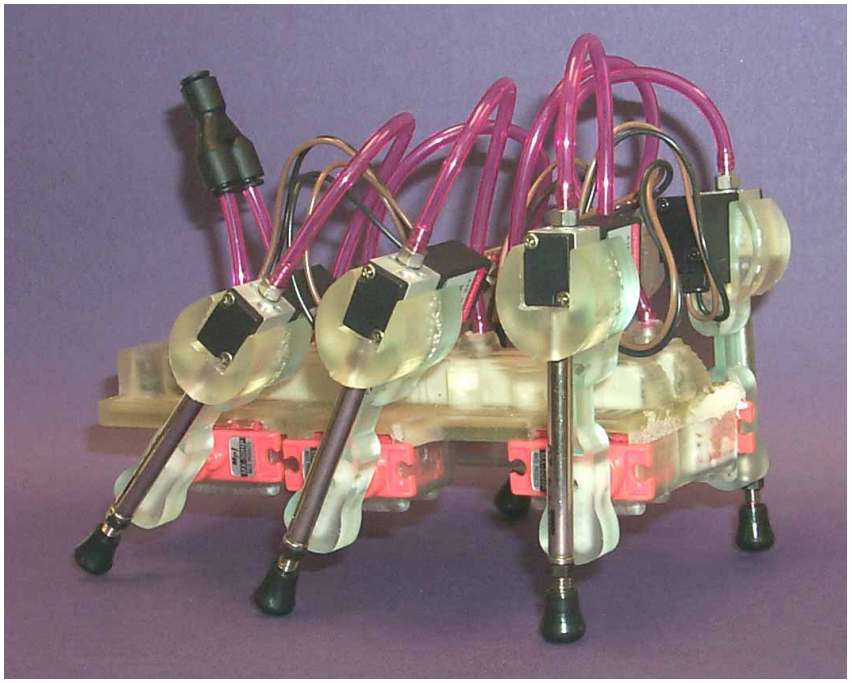
Batch-Fabricated Sprawl Robots

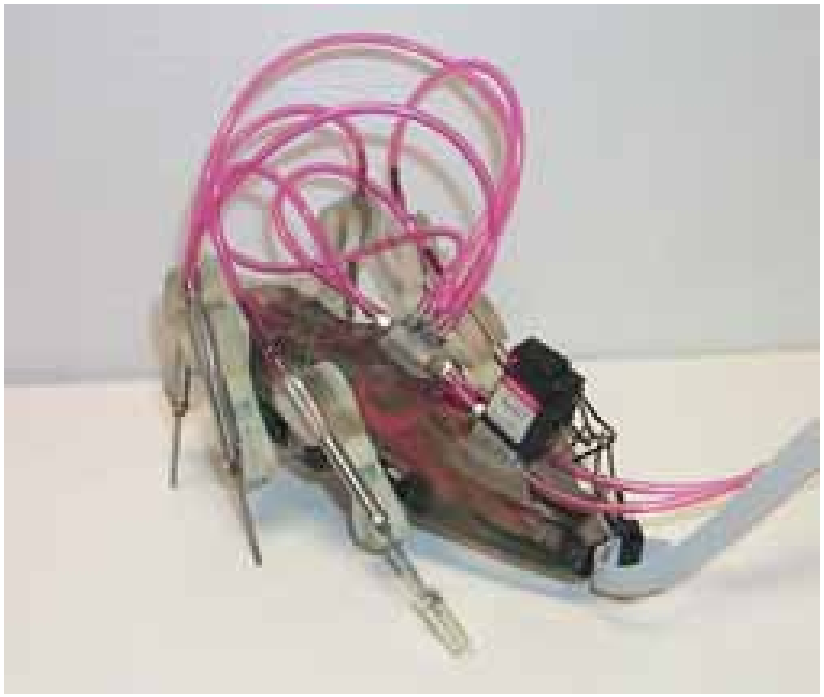


The Sprawlettes: Spring/Summer 2001

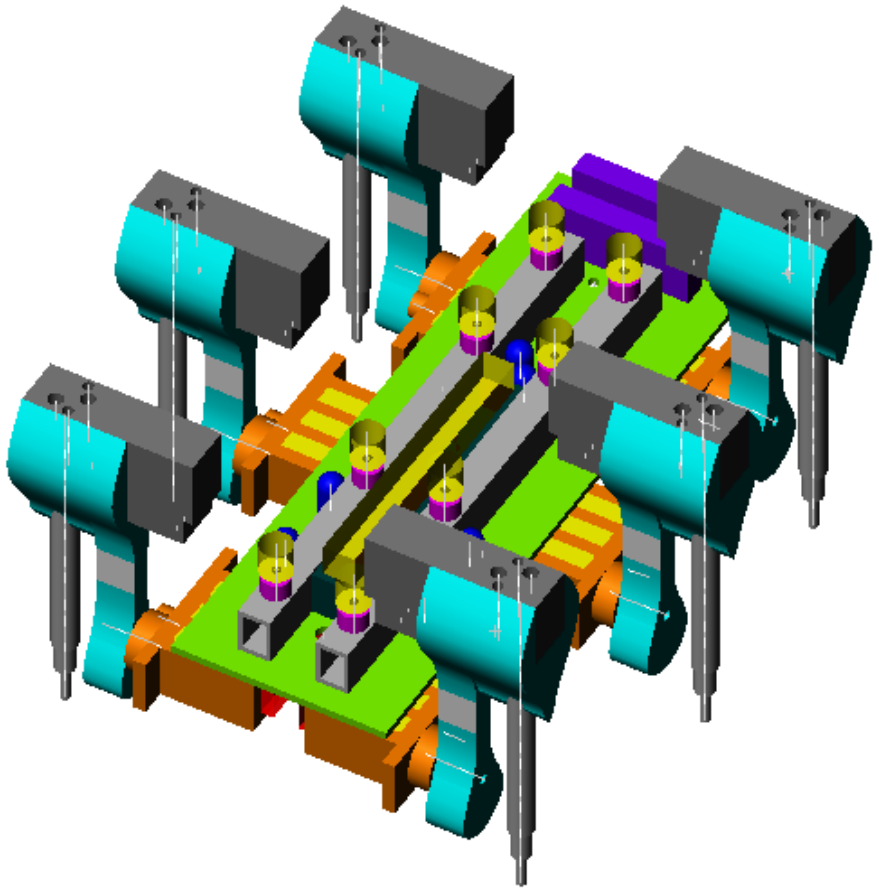
- "design for SDM"
- manufacture in a batch to reduce costs, effort
- one valve/leg, connected directly to piston for efficiency, speed *(per Sprawley-Davidson)*
- internal air reservoirs to reduce tubing
- TERN microcontroller for local control, data acquisition
- flexible platform for experiments in gait, adaptation, timing, etc.

Variable, replaceable, controllable

Similar to Sprawlita, but SDM batch-manufactured for low cost*
and designed for flexibility, experimentation



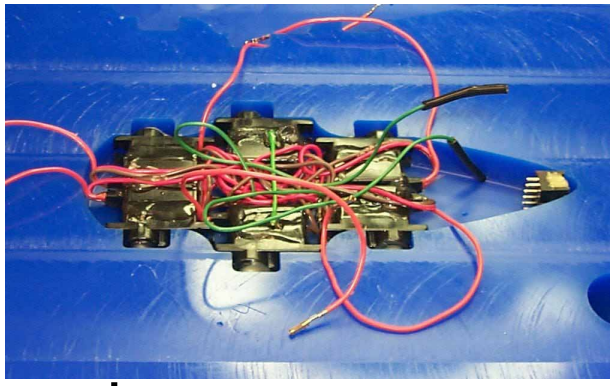
Sprawlita: 150mm, 290g 2 valves



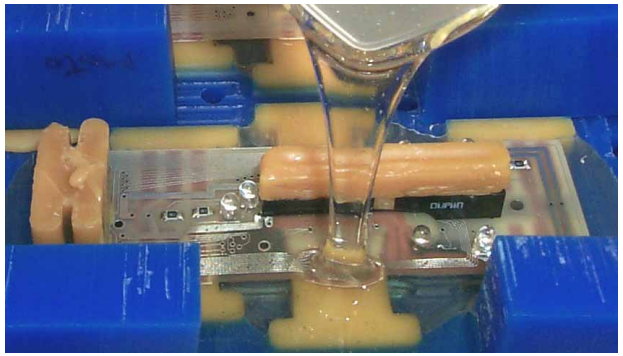
Sprawlettes: 140mm, 353g, 6 valves

*$1400 including controller

Newly explored batch manufacturing techniques



No more messy wiring…



Embedded circuit board with provisions for sensors

Replaceable servos and replaceable flexures (customize for different weights, tasks)

More Possibilities for Future Exploration

More robust body material → More compliant material

→ Fiber reinforced composite material

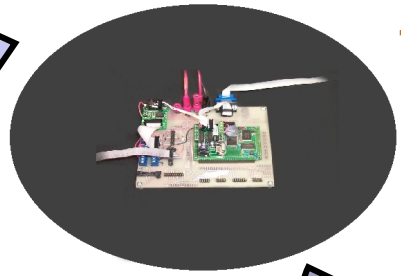
More robust body geometry → Non-exposed features

Sprawlette Controller

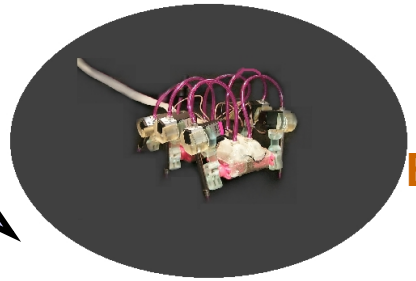
Requirements

- **Flexible**
  - Input-Output Configurable
  - Ready for data acquisition and experimentation
- **Portable**
  - Plug-n-Play design
  - No hardware installation
- **Potential**
  - On board operation
  - Stand Alone

PC Interface



TERN Microcontroller

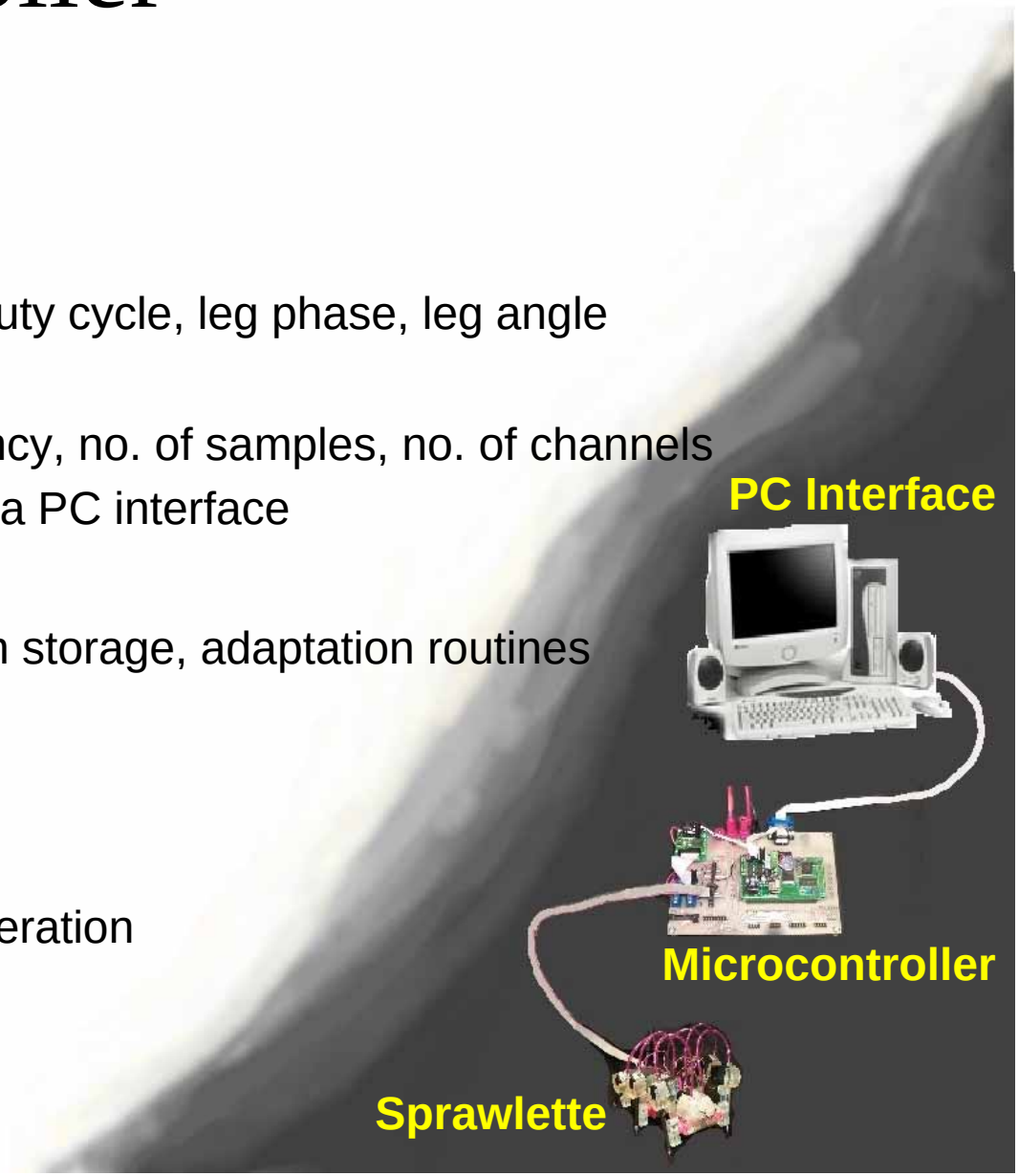


Batch Sprawlettes

Sprawlette Controller

Specifications

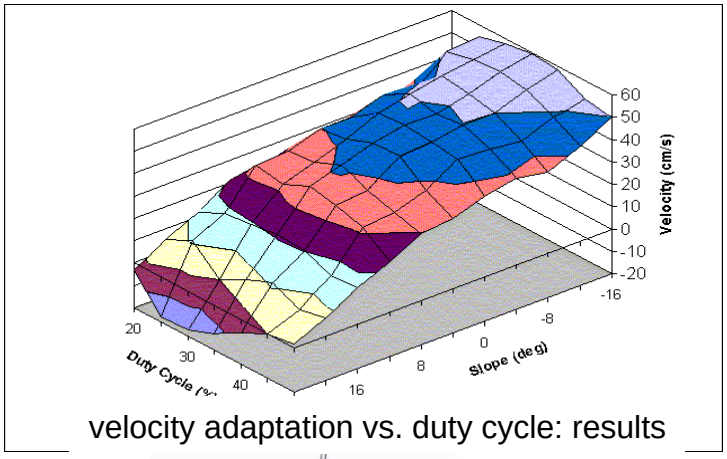
- Full Body Locomotion Control
  - Parameters: gait period, leg duty cycle, leg phase, leg angle
- Data Acquisition and Storage
  - Parameters: sampling frequency, no. of samples, no. of channels
  - Export data to Matlab m-file via PC interface
- Added Features
  - Diagnosis mode, configuration storage, adaptation routines
- Serial Communication
  - Display and parameter input
- Stand Alone Operation
  - Compact, battery powered operation



Sprawlette Controller

What's Next

- Gait/Adaptation/Other Studies
- On-board control
  - Miniaturization
  - Power source
- Wireless Control



velocity adaptation vs. duty cycle: results