

Robotics Engineering Robotics Technology

Sam Wane

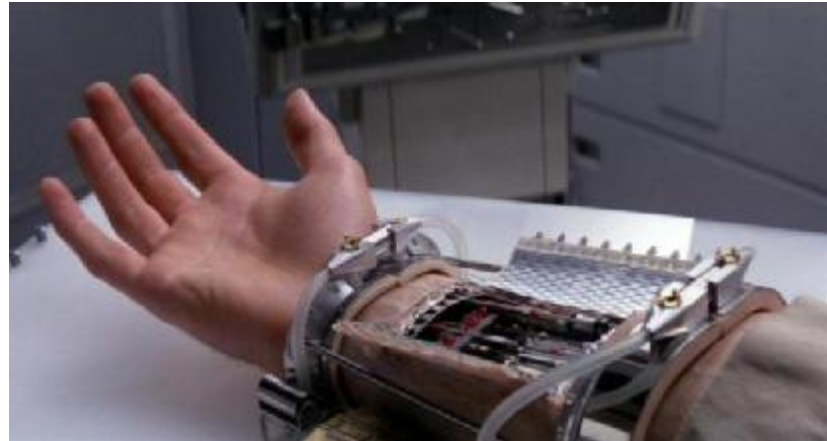
Senior Lecturer in Robotic Engineering
Faculty of Computing,
Engineering and Technology



My Inspiration

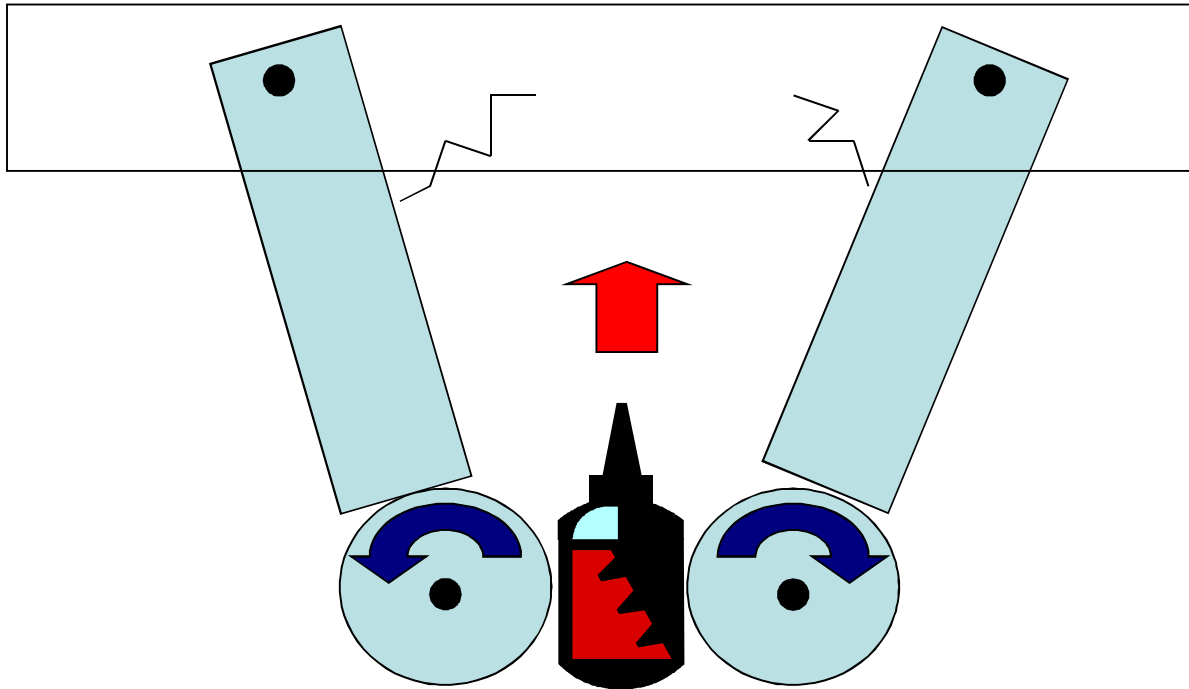


<http://mamacheetah.files.wordpress.com/2010/02>



<http://images.wikia.com/starwars/images/a/af/LukeHand.jpg>

Hull University



Handy-1: Keele & Staffs Uni



**a washing bowl
mirrors
a sponge,
electric shaver,
electric toothbrush
and a rinsing cup**



**an LED control panel for easy selection
mirrors
make-up holders
a selection of make-up applicators**



**an LED control panel for easy selection
a heat tray
a cup (optional)
a purpose designed spoon
a sectioned food dish**

McVities-Carlisle



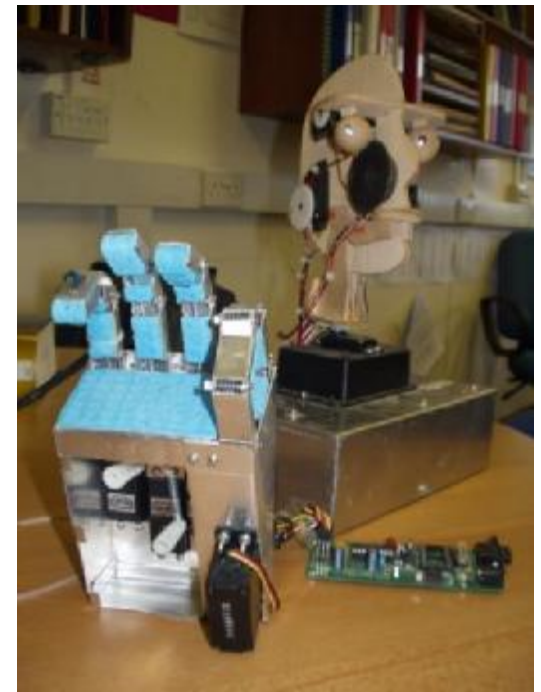
Equipment



History of (mobile) robot development

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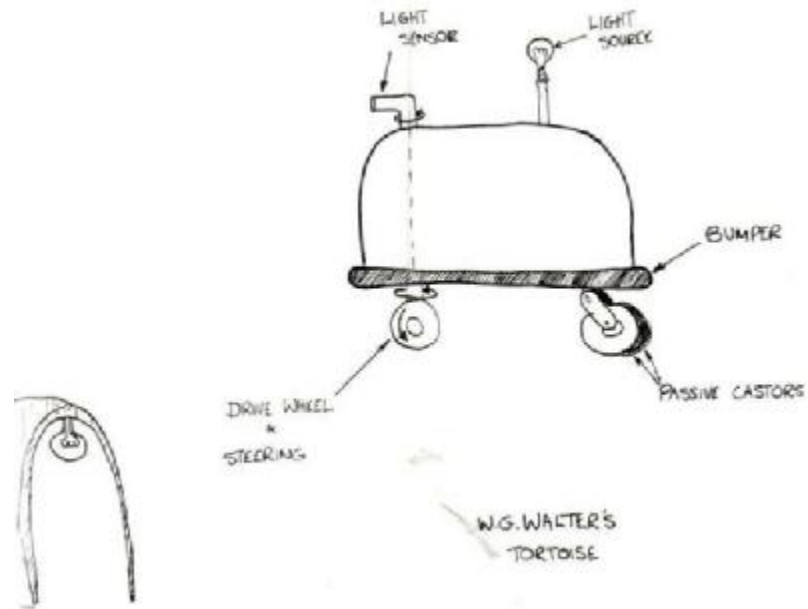
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Grey Walter's Tortoise-1948

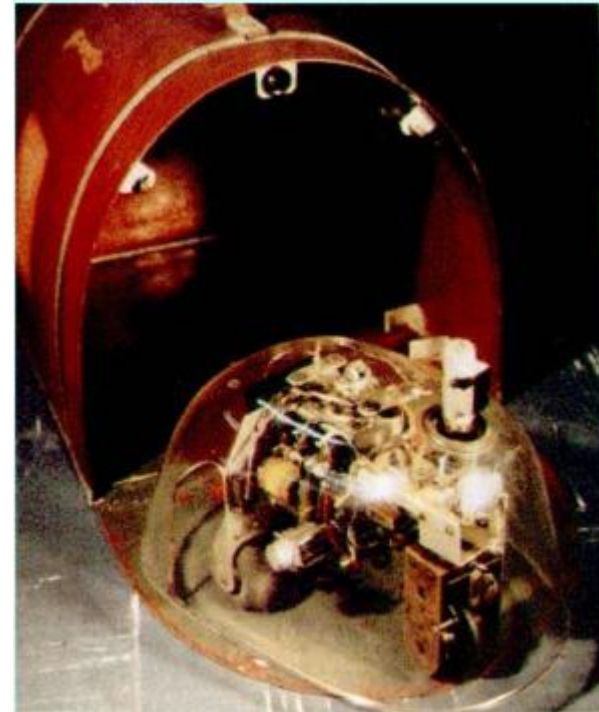
Machina speculatrix, named *Elmer* and *Elsie*, were constructed between 1948 and 1949 and were often described as *tortoises* due to their shape and slow rate of movement

- Steering motor turns continuously
 - If light sensor detects moderate light, stops turning
 - V.bright light=turns at 2x speed
- Heads towards light, when it gets close it quickly moves away
- Hutch recharges, it contains a bright light source
- When batteries run low, heads into hutch, when recharged it backs out again



Grey Walter's tortoise

- Bumper inhibits light sensor for a period=full power oscillations to both motors to move obstacle
- Light bulb when steering motors on:
 - Observe interaction
 - Oscillations When see a mirror
- Simple creatures have complex behaviour

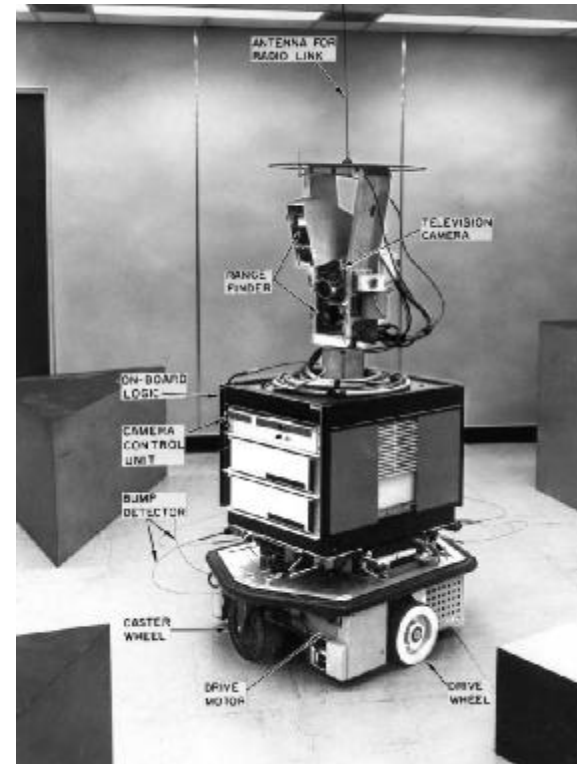


<http://www.ias.uwe.ac.uk/Robots/gwonline/gwonline.html>

Shakey

Stanford Research Institute 1966-1972

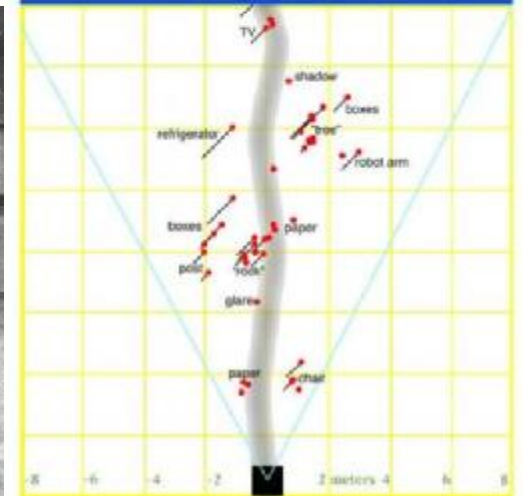
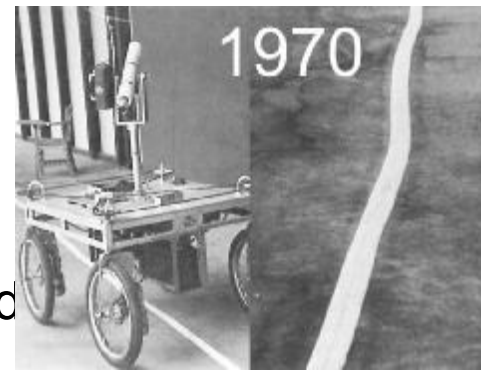
- Named because TV transmitter shook
- Room coloured blocks+wedges
- Plan+think wirelessly, move wedge to get to goal
- Mostly still while off board computer processed images
- Nilsson-Stanford Research Institute



<http://www.ai.sri.com/shakey/>

Cart-1960

- Stanford AI Lab (SAIL)
- Test for NASA:
 - 2.5s round trip delay to moon
- Table with 4 bicycle wheels and a chain
- Moon idea scrapped
- 1967 got to drive 20ft following a white line (PhD Thesis)
J.McCarthy, Rodney Schmidt
- Hans Moravec
 - Stereo vision, mainframe, lurched every 15mins
 - Outside-shadows not static



Allen-1986

- Rodney Brookes
- Subsumption architecture
- LISP
- 20 metre cable
- 20 Polaroid ultrasonic sensors
- IEEE Robotics & Automation 1986



Explore when
see something
useful

Wander

Avoid contact
with obstacles

Genghis-1989

- MIT
- State machine
- BEAM-shadow avoid
- Fast, cheap & out of control-1989
- NASA-rather than 1 x 1000kg explorer, have 100 x 1 kg
- 1/10 payload – cheap
- Simple=short development time-fast
- Autonomous, sacrificial rover



<http://www.ai.mit.edu/projects/genghis/>

Polly-1993

- MIT Tour guide
- Heads towards upright objects
 - Shake a leg for affirmative
 - Boxes etc don't shake!
- Inquisitive visitors flock to it, students shy away
- Hand drawn map

Path planning:

<http://www.araa.asn.au/acra/acra1999/papers/paper12.pdf>

Evaluation of tour robots:

<http://www.cs.washington.edu/homes/fox/postscripts/two-museum-robots-fsr-99.pdf>

Lego

- The first retail version of Lego Mindstorms was released in 1998 and marketed commercially as the Robotics Invention System (RIS).
- The next version was released in 2006 as [Lego Mindstorms NXT](#). The newest version, released in August 2009, is known as [Lego Mindstorms NXT 2.0](#).