

ROBOTICS

M. Bernardine Dias and Brett Browning





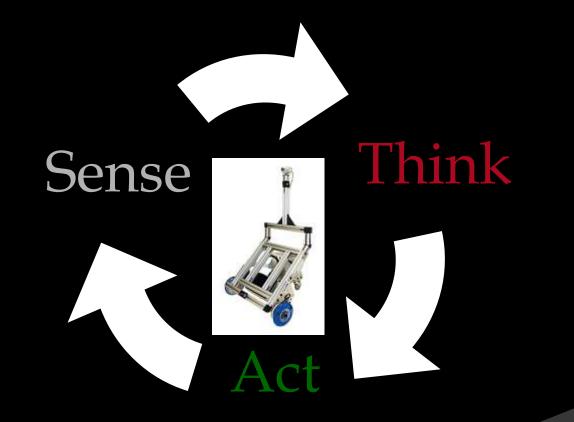
What is a Robot?

Robots can be autonomous, teleoperated, or have sliding autonomy All robots share a "sense-think-act" loop





Robot Control Loop





do

Why Robots?

Outility: things that humans _____

- Cannot ...
- Do not want to ...
- Should not ...

• Knowledge/Science

• Can we understand how humans/animals do ____

Intellectual curiosity:

Is it possible to do get a machine to do _____

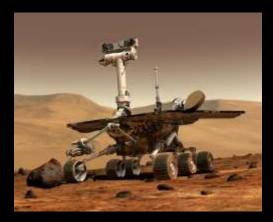


Exploration

















Autonomous Vehicles















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Industrial Robotics

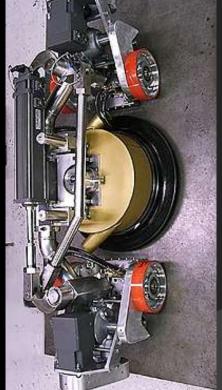














Edutainment













Challenges in Robotics

- Noise
- Real-time constraints
- Uncertainty
- Failures
- Limited and changing resources
- Oynamic and unknown environments
- Challenges in interacting with other agents



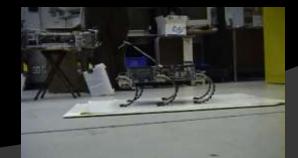
Robot Control













QRI8 ROBOTICS LAB

<u>Faculty</u> M. B. Dias, B. Browning, M. Sakr, Y. Cooper

<u>Postdoc</u> P. Hansen



Qri8 Lab Goals

- Advance the state-of-the-art in autonomous mobile robotics
 - Current focus areas: Coordination, perception, learning, interaction
- Create technology of impact to the community and to industry
 - Current focus areas: Oil & natural gas industry, underserved communities
- Educate the next generation of Roboticists and Computer Scientists
 - Current outreach events: BotBall, CS4Qatar







Education

Mobile Robot Programming

- Junior/Senior course
- Java/C++ on modified ER1
- Focus on autonomy

Artificial Intelligence

- Junior/Senior course
- Focus on algorithms and their applications
- Project on student's choice of topic

• iSTEP: innovative Student Technology ExPerience

- Junior/Senior course and summer internship
- Real-world projects/partners in developing community
- Globally distributed multidisciplinary teams

EXPERIENCE



iSTEP



Outreach

BotBall

- Annual high school competition
- 7 week timeline
- 30+ schools from 4 countries
- Lego + IC + iCreate

CS4Qatar

- Annual high school student workshop
- 120 students over weekend event
- Python + iCreate





QRI8 TEAM



Core Team



M. Bernardine Dias



Ameer Abdulsalam



Brett Browning

Imran Fanaswala



Majd Sakr



Yonina Cooper



Samitha Ekanayake



Mohamed Mustafa



Peter Hansen





Extended Team





Reid Simmons



Tony Stentz



Peter Rander



Balajee Kannan



Freddie Dias



Sarah Belousov



Ermine Teves











Current Students



Samreen Anjum



Maha Al-Moghany



Hend Gedawy







Hatem Alismail



Ayorkor Korsah



Maxim Makatchev



Beatrice Dias



Alumni





Charles Thorpe



Brenna Argall



Gil Jones



David Duke



Justin Carlson



Ghazzawi



Noura El-Moughny



Hatem Alismail



Hend Gedawy



Aysha Siddique



Kaleem Rahman



Several other undergraduate student researchers



Robots++



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Linia Curra



PROJECTS



Human Robot Interaction



Funded by a QNRF NPRP Round #1 Grant

Qatar team:

- Majd Sakr (PI)
- Brett Browning (Co-PI)
- Imran Fanswala
- Wael El-Ghazzawi
- Ameer Abdulsalam

Pittsburgh team:

- Reid Simmons (Co-PI)
- Maxim Makatchev







Visual Mapping





Funded by CMUQ Seed Grant

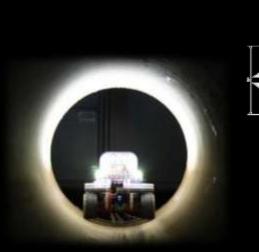
Team:

- Brett Browning (PI)
- Hatem Alismail
- Mohamed Mustafa





LNG Pipe Vision



الصدوة.. القطري لردلية البحت ألما Qatar National Research Fund,

Member of Oatar Foundat

NATIONAL ROBOTICS

ENGINEERING CENTER



Funded by a QNRF NPRP Round #2 Grant

Qatar team:

- Brett Browning (PI)
- Peter Hansen
- Mohamed Mustafa

Pittsburgh team:

- Peter Rander (co-PI)
- Hatem Alismail

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Assistive Technology









Funded by a QNRF NPRP Round #1 Grant

Qatar team:

- M. Bernardine Dias (PI)
- Imran Fanswala
- Wael El-Ghazzawi
- Ameer Abdulsalam
- Hend Gedawy

Pittsburgh team:

- Ermine Teves
- Beatrice Dias
- Sarah Belousov
- Freddie Dias

Literacy Tools





جامعت صاریجی میلور هی **قطر** Carnegie Mellon Qatar

Funded by CMUQ Seed Grant

Team:

- M. Bernardine Dias (PI)
- Yonina Cooper
- Silvia Pessoa
- Aysha Siddique
- Sarah Belousov
- Ermine Teves
- Freddie Dias
- Hatem Alismail
- Ayorkor Korsah
- Beatrice Dias



Education e-Village



Education e-village

Introduction to Robotics

Syllabus



rcs and expressing, resulting in systems that act intelligently with their anyronment. With cations ranging Non-agriculture to factory explore, from handfly are to adjustition, robot along and has way to develop creativity a the iterior, stolementation, and integration: at are examined for computer scientists and

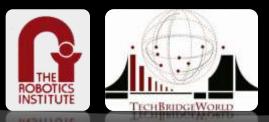
Rectinguital through galies's and that's to constrain the

in this course, studients will work individually and in prouse to build robots using ng kits and to program them using me warn how to write programic that control a physical device. They will learn to read and stand revearch papers, to give presentations to technical and non-technical au ugh from an initial often through design t

Funded by CMUQ **Seed Grant**

Team:

- M. Bernardine Dias (PI)
- Kaleem Rahman
- Saurabh Sangvi
- Sarah Belousov
- Ermine Teves
- Freddie Dias
- •Ayorkor Korsah
- Brett Browning





Disaster Response







Commerce Laborau



Funded by a QNRF NPRP Round #1 Grant

Qatar team:

- M. Bernardine Dias (PI)
- Imran Fanswala
- Wael El-Ghazzawi
- Ameer Abdulsalam

Pittsburgh team:

- Tony Stentz (Co-PI)
- Ayorkor Korsah
- Balajee Kannan
- Freddie Dias



Get Involved!

Join a project

- Independent studies
- Senior thesis
- Summer internship
- Take the AI and/or robotics courses
- Volunteer for outreach
 - BotBall robotics workshop and competition
 - CS4Qatar robotics workshop



Questions?

