

ROBOTICS

M. Bernardine Dias and Brett Browning

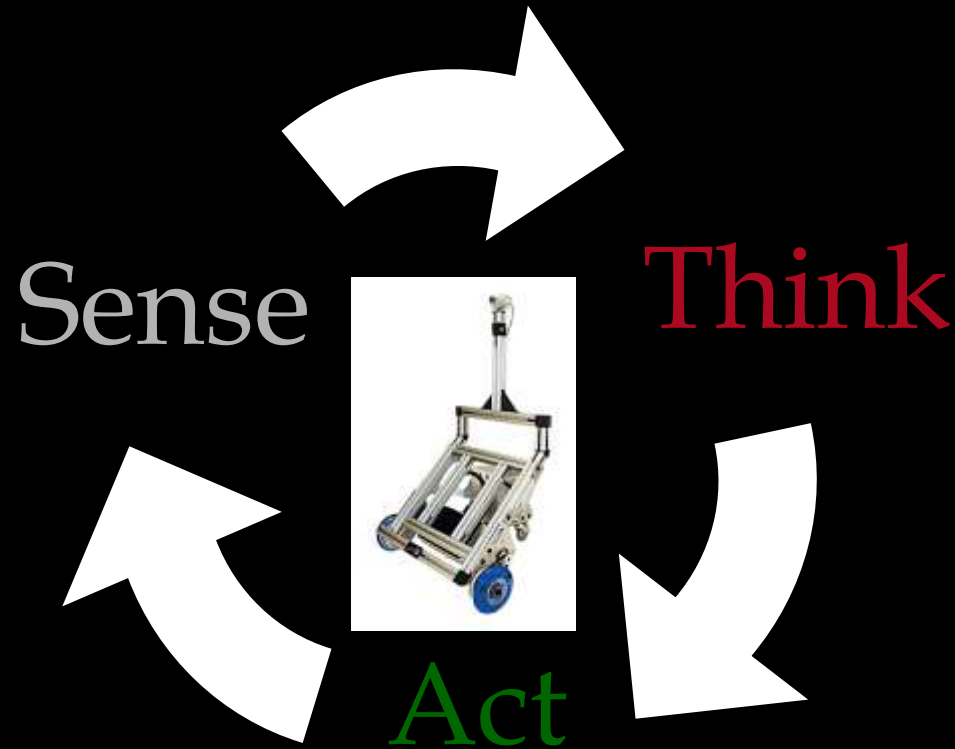


What is a Robot?

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



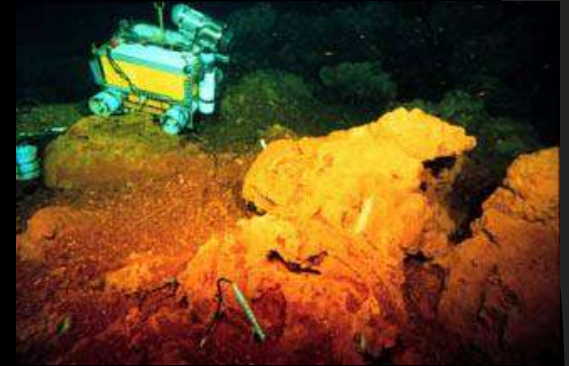
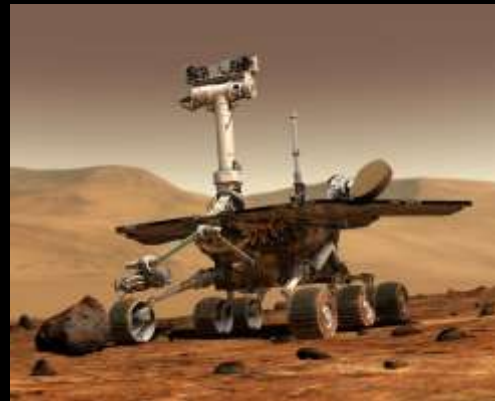
Robot Control Loop



Why Robots?

- ◎ **Utility: things that humans _____ do**
 - 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 ___ ?

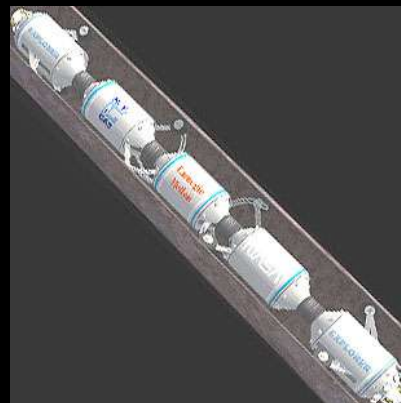
Exploration



Autonomous Vehicles



Industrial Robotics



Edutainment



Challenges in Robotics

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

Robot Control



QRI8 ROBOTICS LAB

Faculty

M. B. Dias, B. Browning, M. Sakr, Y. Cooper

Postdoc

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



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



جامعة كارنيجي ميلون في قطر
Carnegie Mellon Qatar

QRI8 TEAM



Core Team



M. Bernardine
Dias



Brett
Browning



Majd
Sakr



Yonina
Cooper



Ameer
Abdulsalam



Imran
Fanaswala



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



Wael Al
Ghazzawi



Noura
El-Moughny



Hatem
Alismail



Hend
Gedawy



Aysha
Siddique

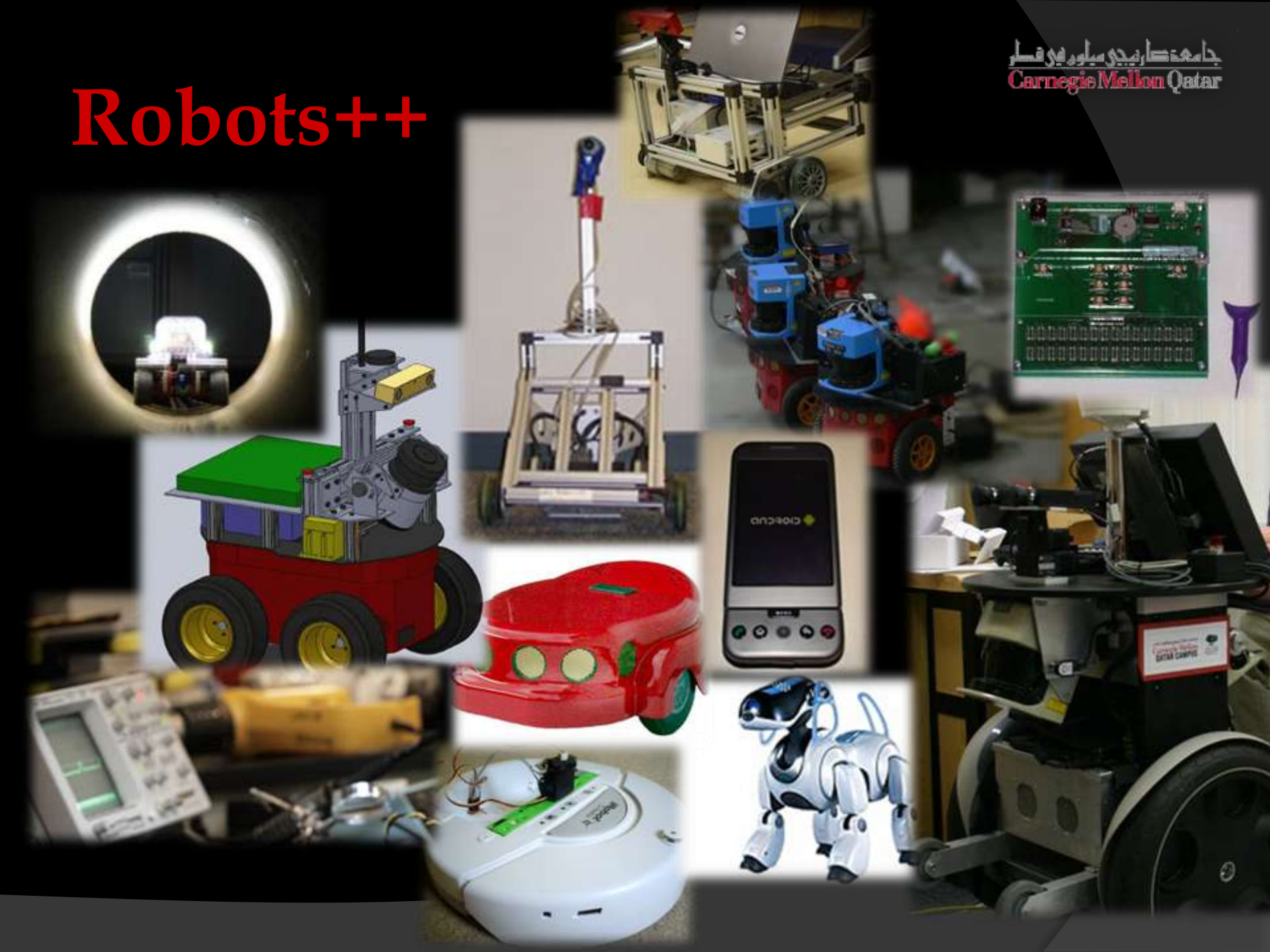


Kaleem
Rahman



Several other undergraduate
student researchers

Robots++



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Carnegie Mellon Qatar

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



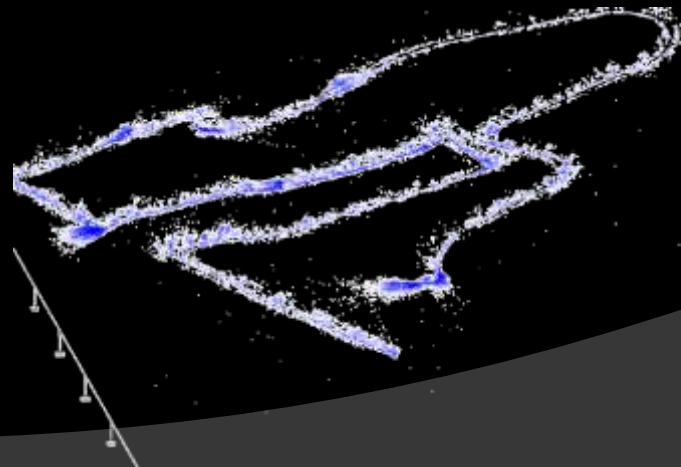
Visual Mapping



**Funded by CMUQ
Seed Grant**

Team:

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



LNG Pipe Vision



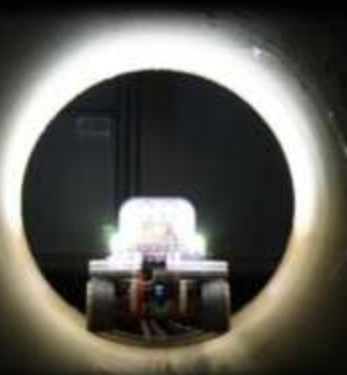
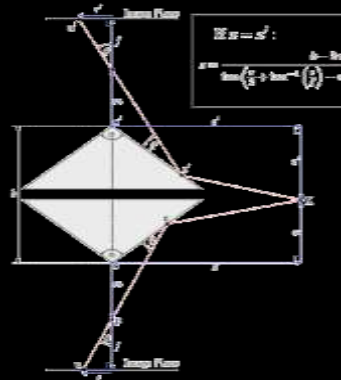
Funded by a QNRF
NPRP Round #2 Grant

Qatar team:

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

Pittsburgh team:

- Peter Rander (co-PI)
- Hatem Alismail



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



**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



**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



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?

