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NUIM: RoboCup Proposal

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The Hamilton Institute



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NUIM: RoboCup Proposal

What is RoboCup?

Why form an NUIM Team?

- Background
- Aims for NUIM Team

Where are we now?

Where to next?



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What is RoboCup?

An international research initiative involving a symposium, research SIGs, and robot competitions.

Aim: to foster and accelerate artificial intelligence and robotics research by providing a standard yet highly non-trivial problem.



www.robocup.org

RoboCup's vision:

"...build a team of robot soccer players, which can beat a human World Cup champion team..." (by 2050)



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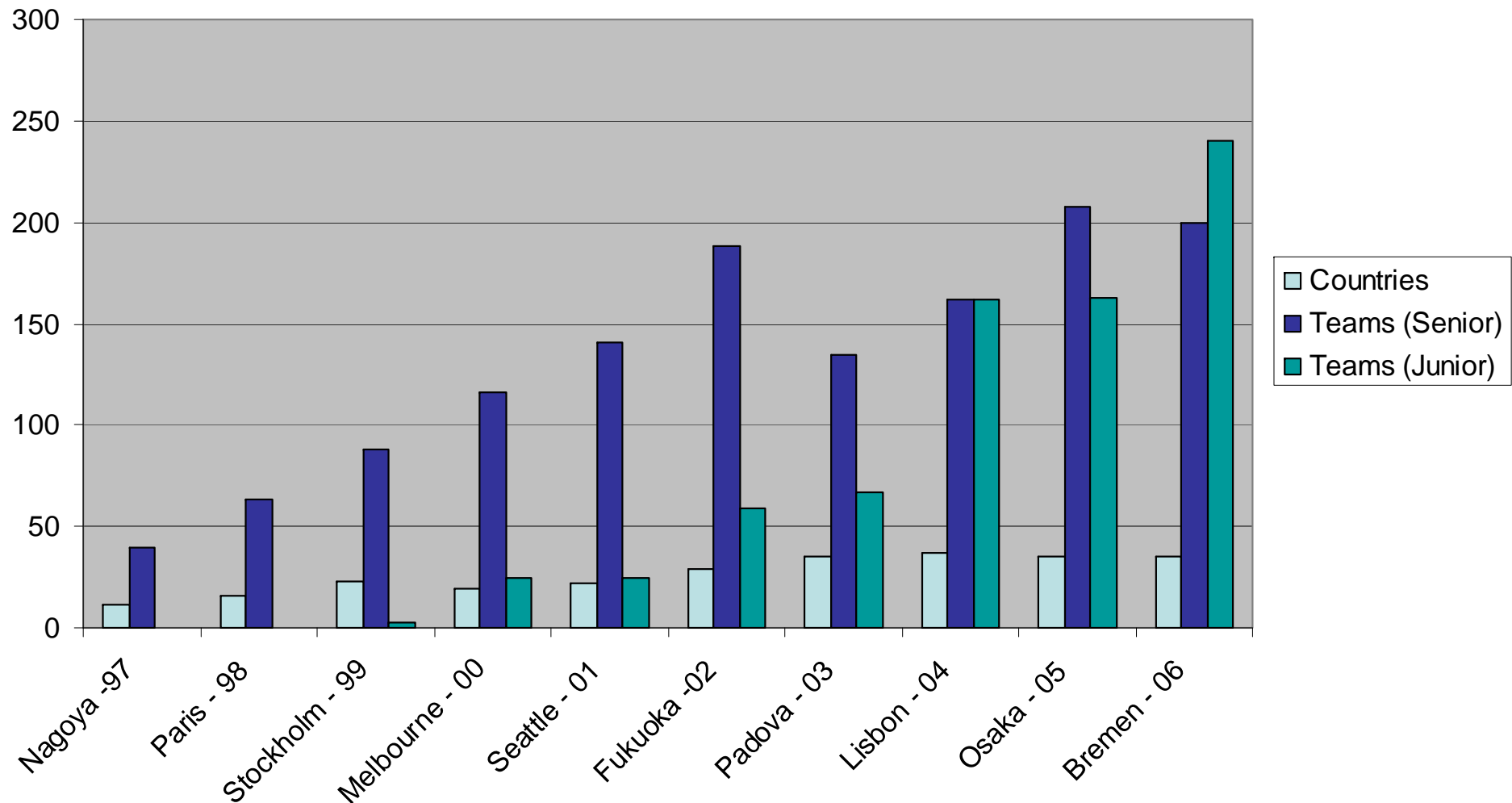
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History of RoboCup International Numbers





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What is RoboCup?

Four Leagues:

1. RoboCup Junior
2. RoboCup Rescue
3. RoboCup@home
4. RoboCup Soccer

Several divisions within each league.



www.robocup.org



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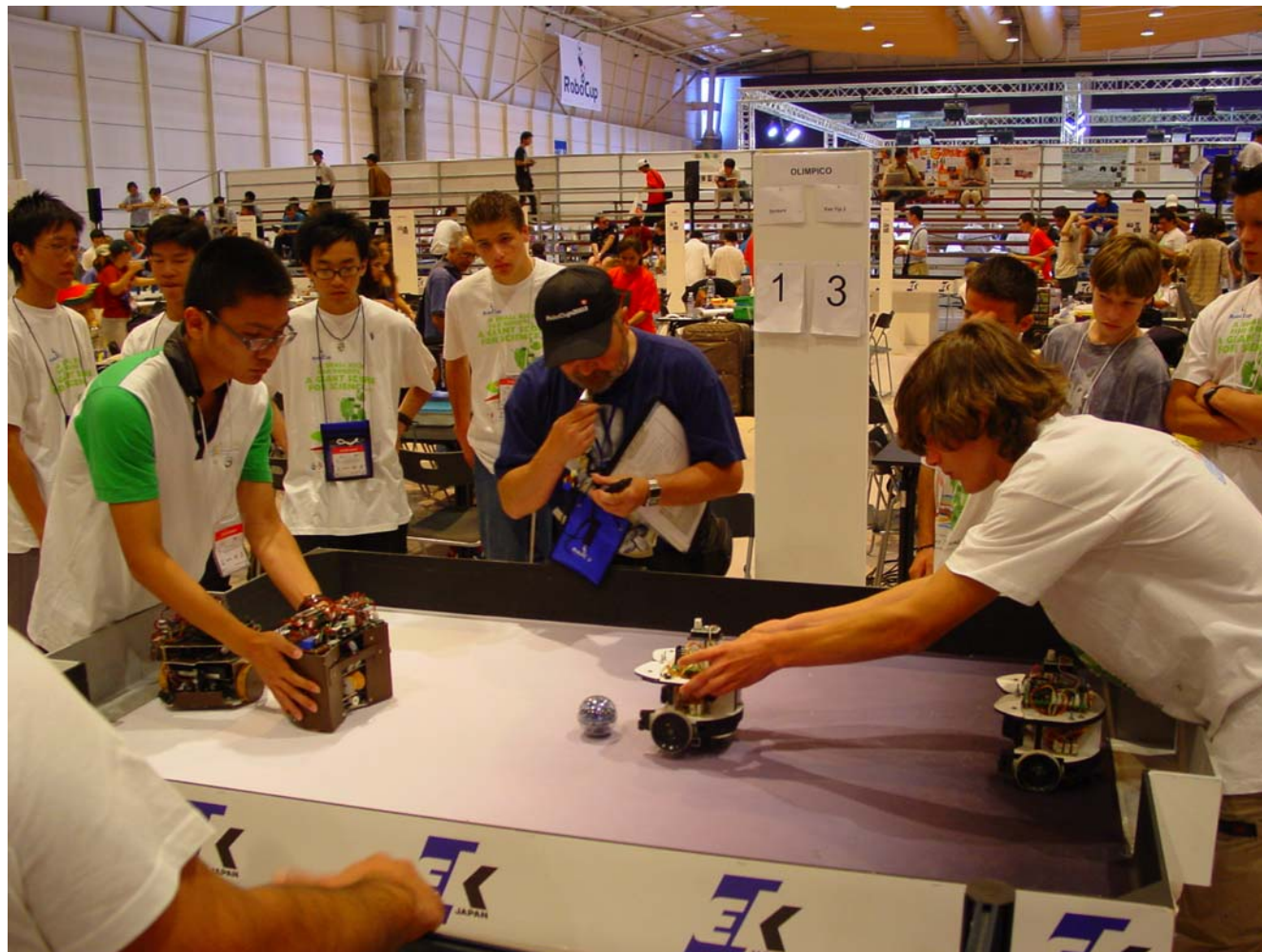
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RoboCup Junior (Irish involvement through NCI) Dance, Rescue, Soccer





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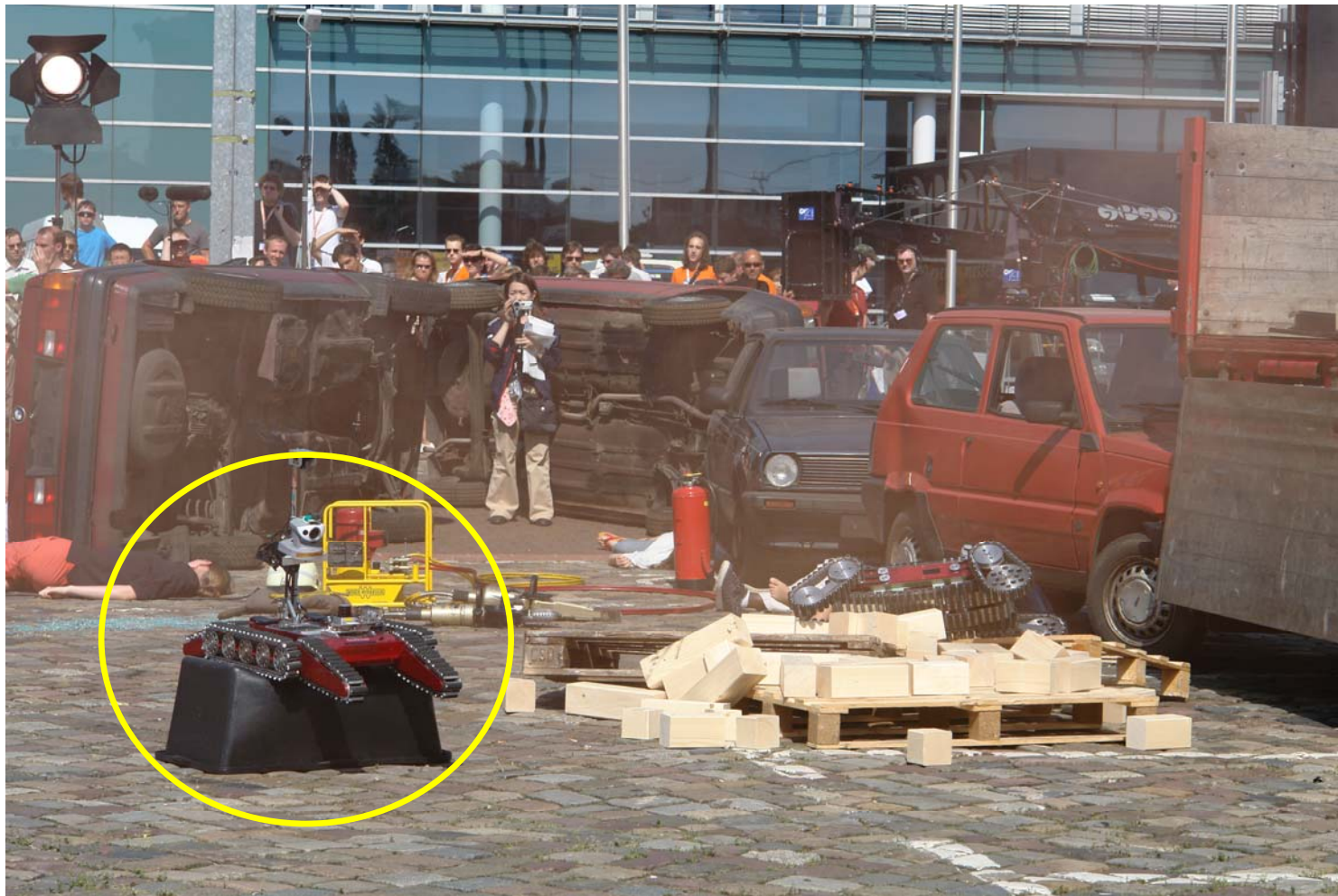
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RoboCup Rescue League





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RoboCup@home League





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RoboCup Soccer: Leagues

Simulation

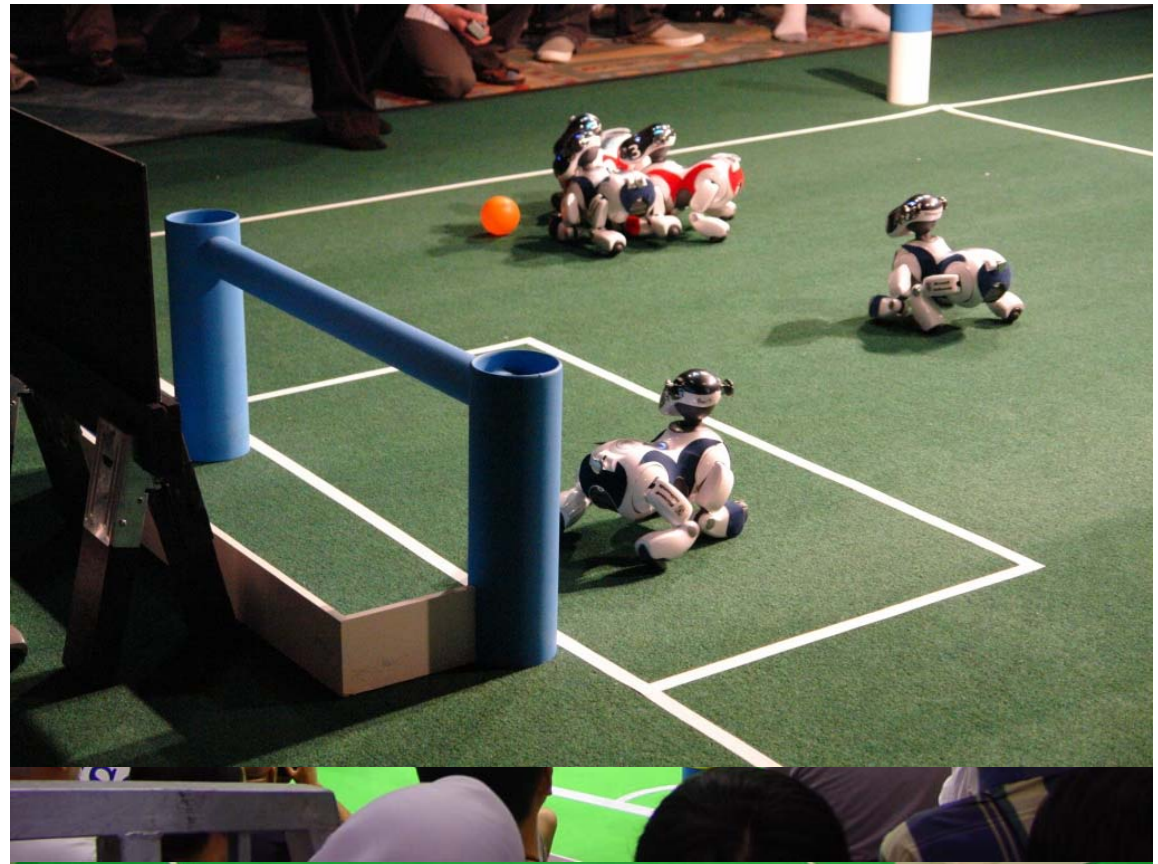
Small Size

Middle Size

Four Legged League

– (Standard Platform
League 2008)

Humanoid League





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Why an NUIM Team?

Background:

**Involvement in Newcastle
(Australia) University Robots team
(NUbots)**

4 Legged League Team

Top 3 place 2002-2007

1st place 2006.





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RoboCup – Soccer - 4 legged league:

4 Sony ERS7 Aibos per side

10 minutes halves

Colour coded field, objects
ball

No human assistance

Referees/rules for:

- Pushing
- Illegal defender
- Leaving the field
- ...





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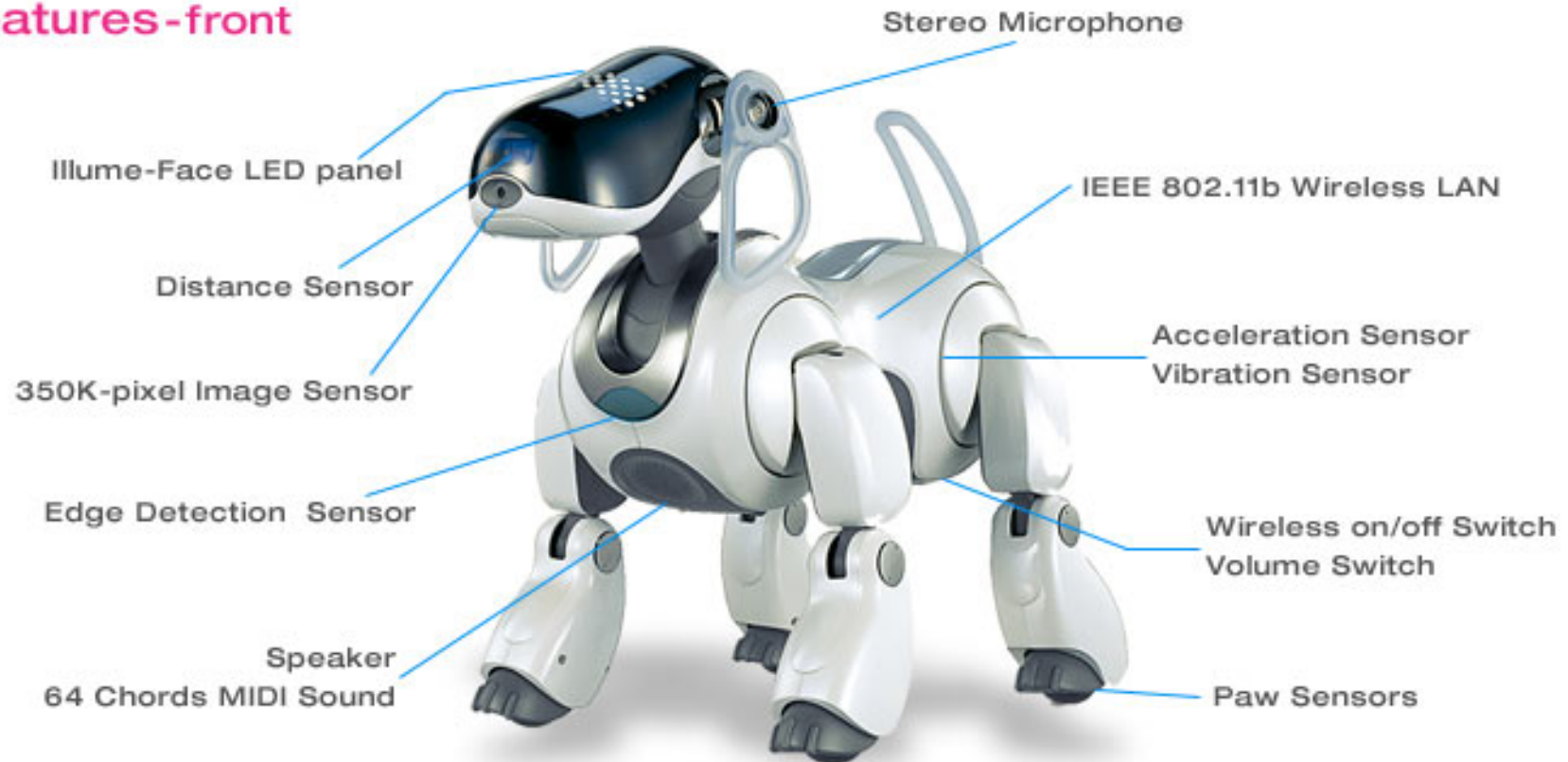
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The Sony ERS7

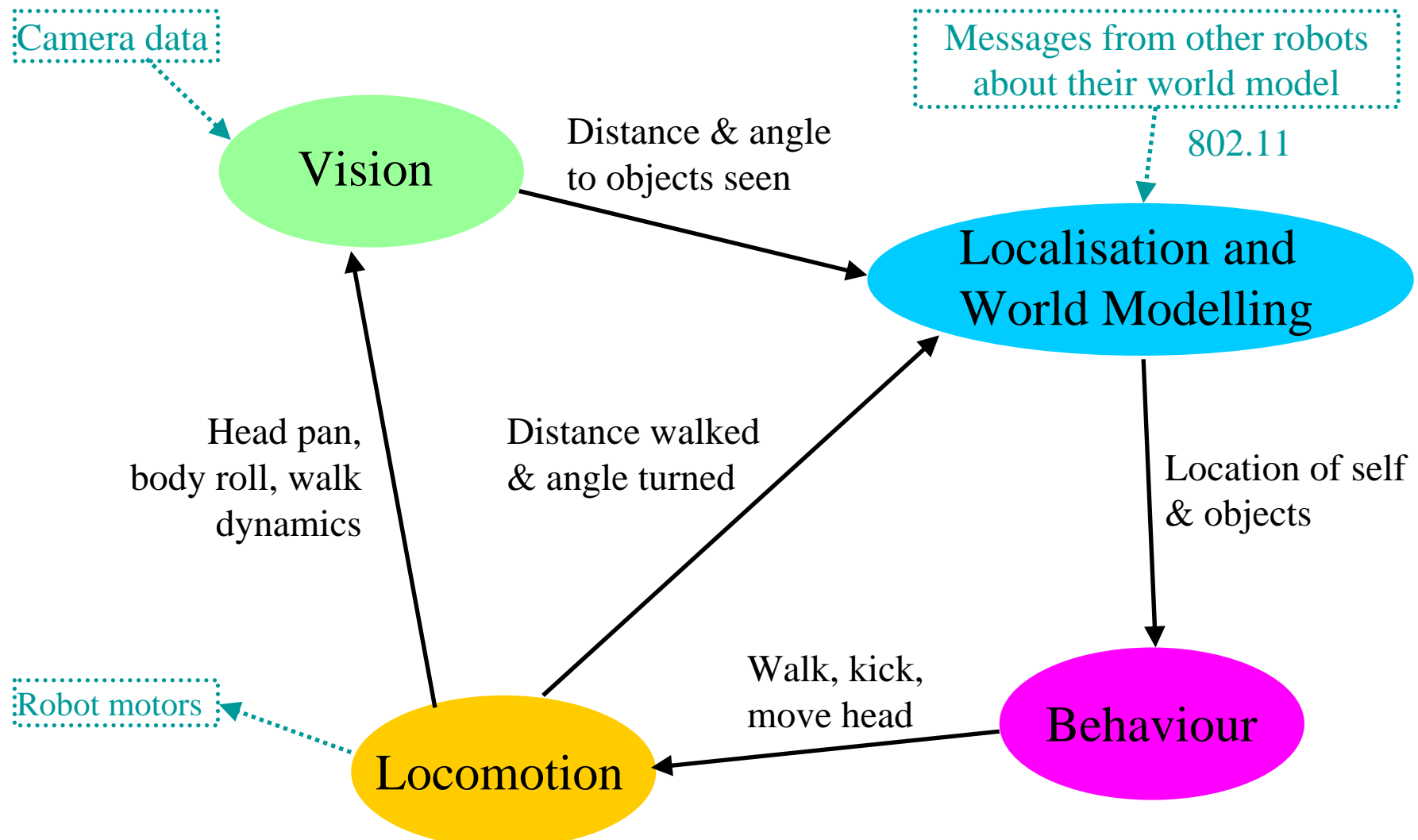
► Features-front



(<http://www.sony.net/Products/aibo/>)



Typical software structure:





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2007 NUbots approach - Vision

Colour coded
environment

Objects

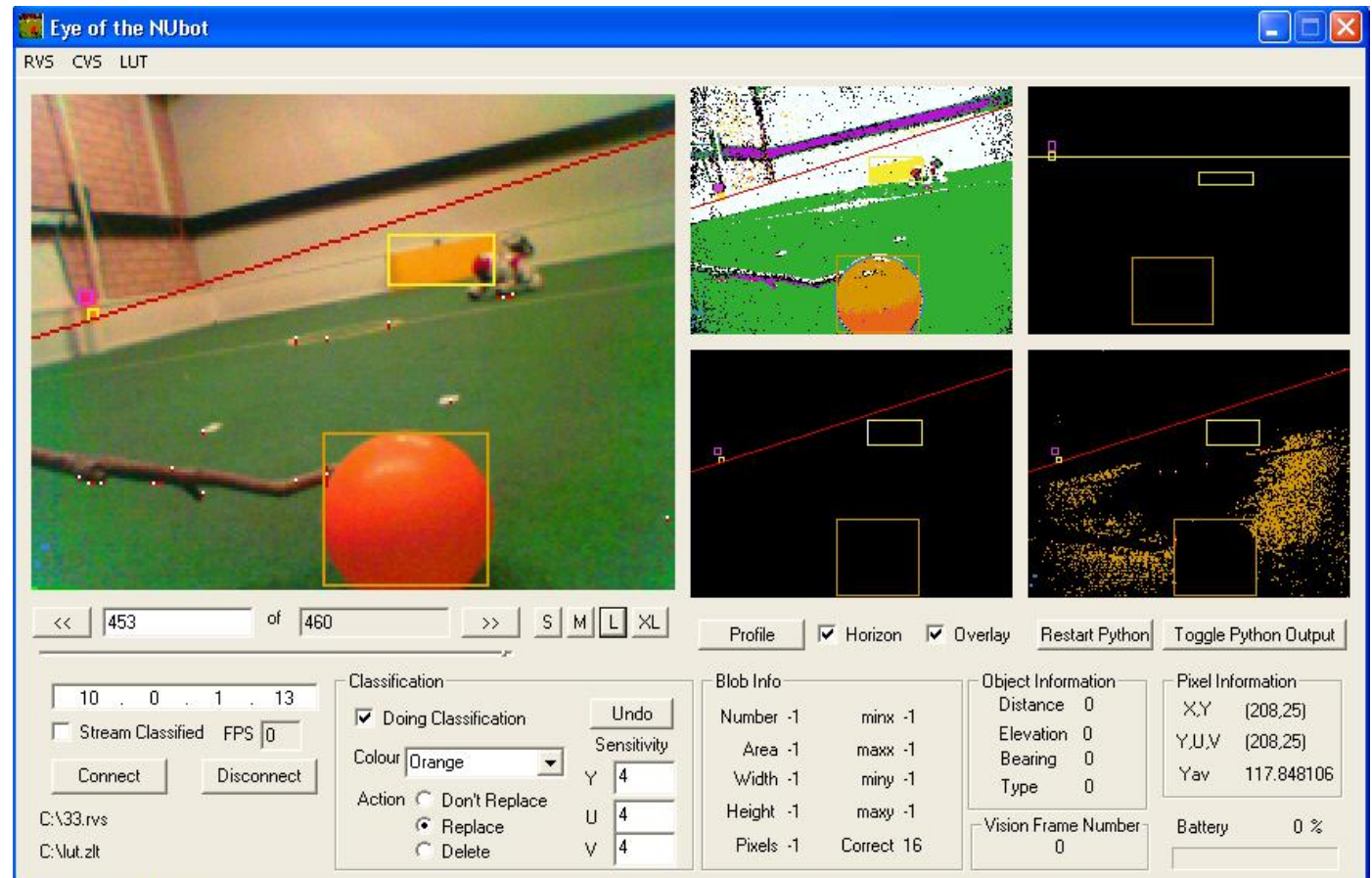
- Ball
- Goal
- Beacon
- Robot

Input image

Classified image

Group colour

Is it an object???





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World Model

Where am I??!

What can I see?

Where is the ball?

How sure am I?

Where is every one else?





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Behaviour and Locomotion

What do I do now that I know where I am,
where the ball is and where everyone else
is?

Behavior tells the robot how to get to the
ball and then how to get it to the goal

- Do I chase the ball?
- Do I grab the ball?
- Which walk?
- Which kick?

Locomotion defines the parameters
required for the action





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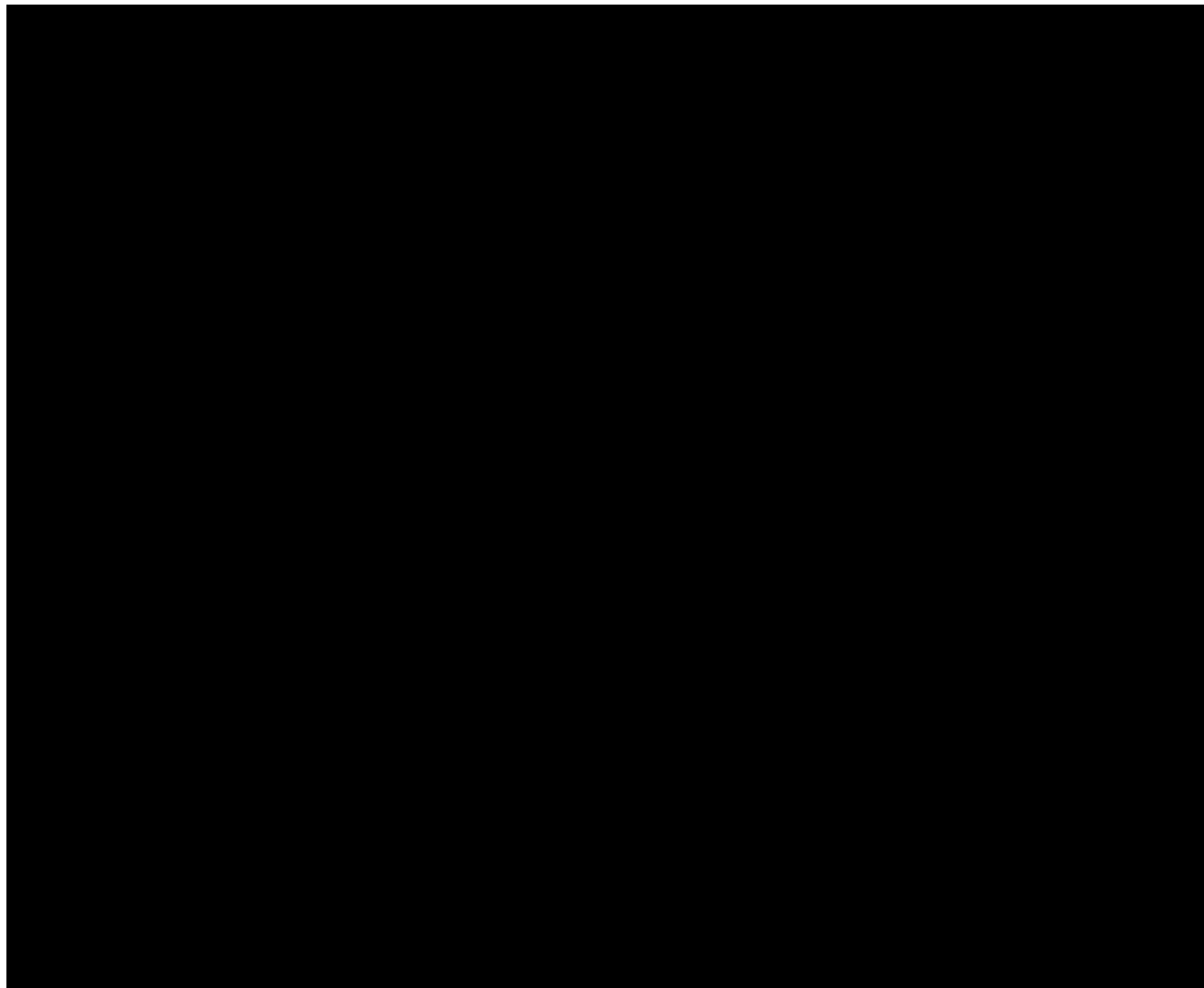
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Some of our plays from the 2006 final...





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Why an NUIM Team?

Background:

Interest from Computer Science, Electronic Engineering,
Hamilton

- MacDonald, Mcloone, Mcloone, Maloco, Markham, Middleton, Pearlmutter, Ringwood, Solmaz, Ward, Winstanley,...

Startup Funding Opportunities:

- SFI, HEA, UREKA,...

Technical Challenges & Opportunities:



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Why an NUIM Team – current (2007 World Championships) Humanoid Performance





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Why an NUIM Team?

Team Aims:

Compete at a high level internationally in RoboCup

To make new research contributions in robotics

- Machine learning, legged locomotion dynamics & control, real time vision systems, perception & inference,...

To promote the study of computing, engineering & mathematics



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Where are we?

Several preliminary team meetings

Financial Support from SFI

Application for HEA Equipment support



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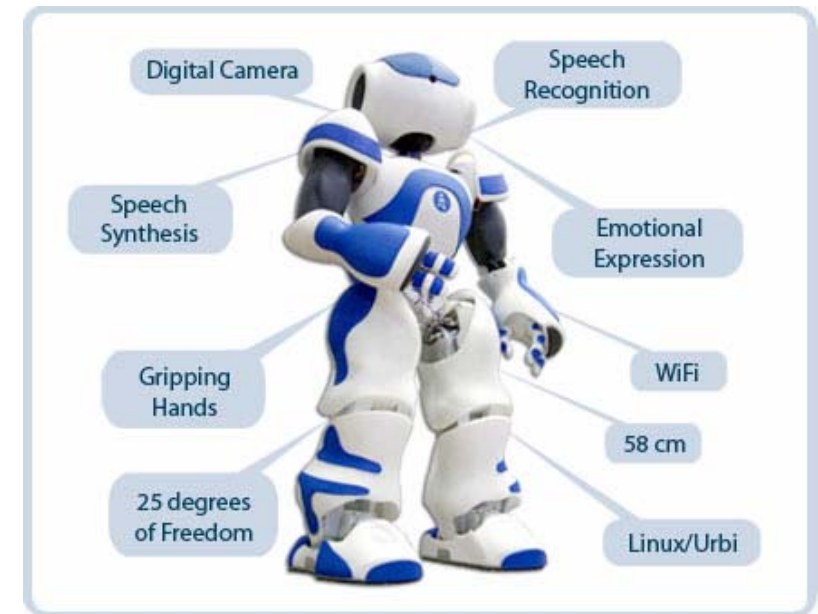


Where to next?

Infrastructure: Space, Computers,
Robots, Field, ...

Apply to RoboCup to compete in
either:

1. “Standard Platform League”
(humanoid successor to four legged
league – “Nao”)
2. “Humanoid League” (Robot ‘bear’
ordered)





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Where to next?

Student Projects (Computer Science or Electronic Engineering) – *on offer now*

The Possibilities:

- Work Placements?
- Summer Scholarships?
- Compete in RoboCup International (China, July 2008)?
- Future postgraduate research?