Growing impactful research and acquiring external funding

Christian Dondrup

Outline

- Current research and impact
- Future research focus
- Immediate funding opportunities
  - EPSRC early career
  - Contribution/Extension to current L-CAS research
- General funding opportunities
  - H2020
- 5 year plan

Current research and impact

- People detection and tracking [1]
  - Used in STRANDS (FP7), SPENCER (FP7), ENRICHME (H20), McMan, FInCoR (RIF)
- Qualitative Spatial Relations for reasoning under uncertainty [2]
  - Used in FInCoR RIF project on human-robot collaboration in a shared workspace and the STRANDS (FP7) project
- Shaping human-aware navigation [3-4]
  - Learning over time based on QSRs
- Physical therapy for older adults in permanent care [5]

[1] Dondrup, C.; Bellotto, N.; Jovan, F; Hanheide, M. **Real-time multisensor people tracking for human-robot spatial interaction**. In: *Workshop on Machine Learning for Social Robotics at International Conference on Robotics and Automation (ICRA),* 2015.

[2] Dondrup, C.; Bellotto, N.; Hanheide, M.; Eder, K.; Leonards, U. **A Computational Model of Human-Robot Spatial Interactions Based on a Qualitative Trajectory Calculus**. In: *Robotics 2015*, 4, 63-102.

[3] Dondrup, C.; Hanheide, M. **Qualitative Constraints for Human-aware Robot Navigation using Velocity Costmaps**. In: *International Conference on Robotics and Automation (ICRA).* 2016. (submitted)

[4] Dondrup, C.; Hanheide, M. **Learning Qualitative Constraints from Demonstration for a Human-aware Local Planner**. In: *ACM/IEEE international conference on Human-robot interaction*. ACM, 2016. (submitted)

[5] Hebesberger, D.; Dondrup, C.; Koertner, T.; Gisinger, C.; Pripfl, J.; **Lessons learned from the deployment of a long-term autonomous robot as companion in physical therapy for older adults with dementia. A Mixed Methods Study**. In: *ACM/IEEE international conference on Human-robot interaction*. ACM, 2016. (submitted)

Previous research beyond L-CAS

- Developmental Robotics [1]
  - How do humans learn and how to apply this to robots
  - Tutoring scenarios
    - Human tutor and robotic tutee.
    - Transferring principles from infant directed behaviour of parents to robotic learning
- Extending current work at L-CAS
  - Include explicit tutoring into live-long learning cycle
    - Complimenting learning from observation/environmental or human feedback

[1] Dondrup, C.; Lohan, K.S.; Saunders, J.; Lehmann, H.; and Nehaniv, C.; Wrede, B. **Keyword detection in human-robot tutoring scenarios.** In: *Humanoids,* November 2012, Osaka, Japan.

Future research focus

Human-centred robotics

- Human-Robot Interaction
  - Healthcare for older adults
  - Assistive Living/Robotics
  - Live-long learning and adaptation.
- Long-term autonomy in populated environments

Funding opportunities in the first 12 month

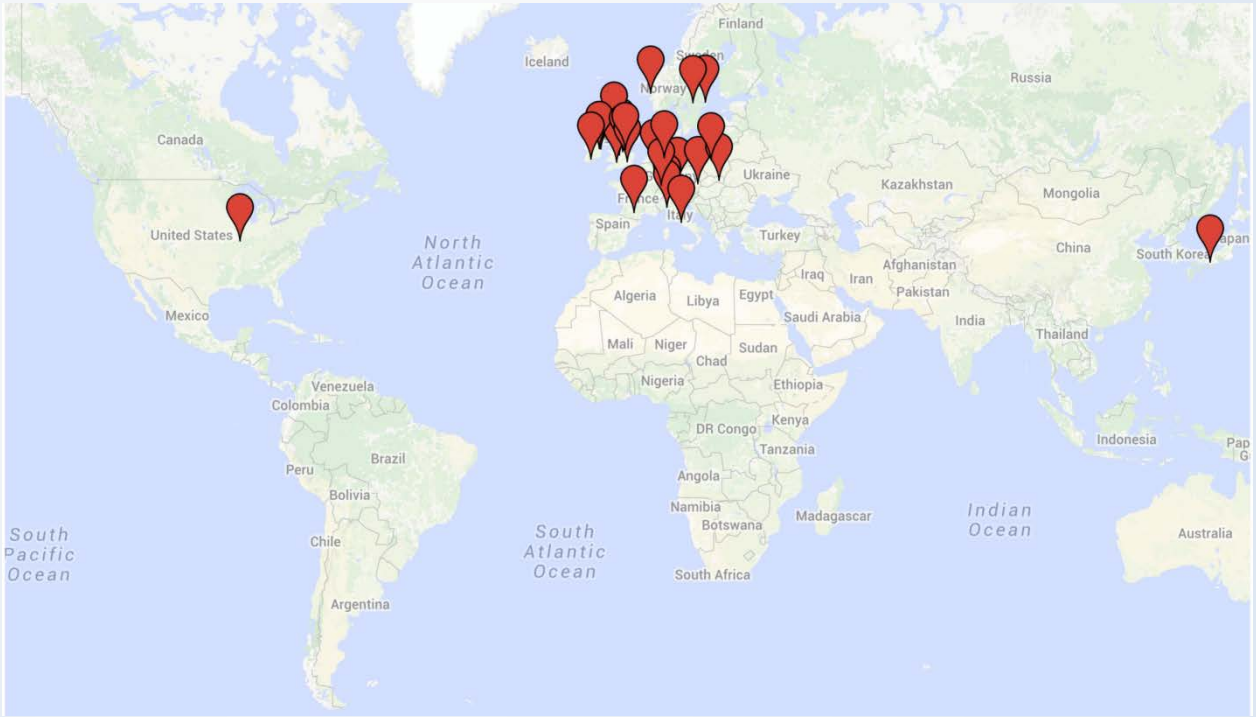
- EPSRC early careers researcher
  - Grant proposal within the first 36 month of lecturer employment
    - Funding capped at £125,000 for maximum of 2 years
  - Possible focus:
    - Health care for the elderly
      - Elder care home/s in the greater Lincoln area
      - Building on walking therapy and human-aware navigation for older adults
    - Automated warehouse scenarios
      - Food production in Lincolnshire
      - Applying previous work to fleets of robots

Funding opportunities in the first 12 month

- Contributing to and extending current Agri-Food Technology projects
  - Automated harvesting
  - Possible funding bodies: BBSRC, Innovate UK, Local producers, etc.
  - Using computer vision detection and tracking pipeline
    - Developed for people detection and tracking
    - Simple algorithms transferrable to other applications
    - Tracking can be used in “3D Vision Assisted Robotic Harvesting of Broccoli” project

General funding opportunities

- Follow-up projects of STRANDS
- H2020/national projects
  - Birmingham
  - Bielefeld
  - Aachen
  - Munich
  - Vienna
  - BMW R&D
  - Freiburg
  - Edinburg
  - Stockholm
  - Bergen
  - Orebro
  - Etc.



H2020 – SPARC

End User Market Domains

- Healthcare
  - Assistive Robotics, Therapy and Rehabilitation
- Consumer
  - Assistive Living
- Logistics & Transport
  - Warehousing, Goods Transport
- Agriculture
  - Agriculture

Robot Abilities

- Adaptability
  - Shaping of robot behaviour
- Interaction Ability
  - Human-aware navigation
  - Tutoring
- Motion Ability
  - Human-aware and long-term navigation
- Perception Ability
  - People perception

H2020 – Current calls

- Advanced robot capabilities
  - *“to develop robots that respond more flexibly, robustly and efficiently to the everyday needs of workers and citizens in professional or domestic environments”*
  - *“… moving from rigid to intuitive human-robot interfaces.”*
- System abilities, development and pilot installations
  - *“To increase the system ability levels in terms of configurability, adaptability, motion, manipulation, decisional autonomy, dependability, interaction, perception and cognitive ability.”*

5 Year Plan

- Immediate – within the next 12 month:
  - Extend contribution to existing projects
  - Involvement in current and future Agri-Food projects
  - EPSRC early career grant
  - Follow-up projects of STRANDS
- General:
  - Contribution to National and H2020 projects
    - Long-term and human-centred robotics
    - Based on current and future contacts and network
  - REF output: Continue publishing to internationally renowned conferences/journals

Thank you!