

Steps towards real applications of cognitive technology

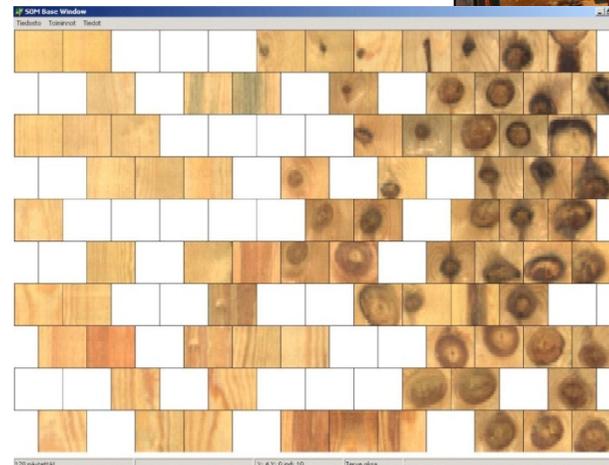
Patrick Courtney
Odense 7 may 2012

Outline

- Motivation: attract & secure continued funding
- Finding applications of cognitive technology
- 3 suggestions for points of connections
 1. End user scenarios and their requirements
 2. Benchmarking & best practice in perception
 3. Public outreach and the cognitive zoo

Applications of cognitive technology

- In a previous eucognition network
- Industrial prize awarded
- Wood processing system
- Utilising of self organising maps
- Business benefits
 - Higher value wood
 - Reliable operation
 - Ease of use
- Grew from EU project
- “Goldilocks” application
 - Not too easy, not too hard
- Worked closely with end users



Various press, vision system design

Too early or too late ?

Hype Cycle for Emerging Technologies, 2011



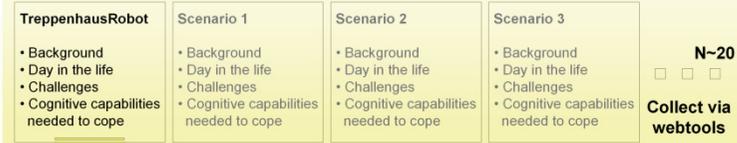
1. Scenarios and their requirements

- Interact with end users
 - and stakeholders
- Collect use cases
 - defined scenarios
- Determine requirements
 - and how to test to them
- Match to capabilities
 - Not too easy, not too hard
- As small scale experiments
 - such as in ECHORD

Proposal: Identify issues of cognitive systems by detailed analysis of specific scenarios

euCognition	Underlying Paradigm	Areas of Cognitive Systems			Typical Issues
		Scientific Foundations	Functional Capabilities	Practical Constraints	
Activities of the Network	Outreach	Events		X	X
	Resources				
	Scientific Outlook	Events			
	Resources				
	Education	Events			
	Resources				
	Online Resources				
	Network Coordination				
Consortium Management					

Step 1: Collection of scenarios



Step 2: Analyse Scenarios, distill commonalities

TreppenhausRobot / Stairwell Robot

Background:

The key capability is learning how to navigate and clean in a domestic type space. A form of this capability already exists in the iRobot 'Roomba' robotic vacuum cleaner, albeit for large American-sized living spaces. This application extends this to the next step to take it into a different environments. The task is thus extended to be more challenging, more European but still useful to millions of people.

Day in the life:

It's 8am on Saturday morning, and the low profile robot wakes up...

Challenges:

different surfaces (carpet, wood, mixed), temporary obstacles like prams, doormats, changing conditions (sunlight, mud), people or pets appear and interfere, ...

Cognitive capabilities needed to cope:

navigation in a controlled indoor space, spatial perception, adaptation to changing circumstances, planning and goal satisfaction, 2D spatial learning. Embodied system with multiple degrees of freedom.



Step 3: Identify research issues, problems, challenges

➡ **Input for milestone definition in road map**

Treppenhaus/stairwell robot

2. “benchmarking” & best practice in perception

- Trust in the technology
select + tune
- Tools and methods available
– and used
- Face localisation is ubiquitous



Available online at www.sciencedirect.com



Computer Vision and Image Understanding 109 (2008) 305–334

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Performance characterization in computer vision: A guide to best practices

Neil A. Thacker ^a, Adrian F. Clark ^{b,*}, John L. Barron ^c, J. Ross Beveridge ^d,
Patrick Courtney ^e, William R. Crum ^f, Viswanathan Ramesh ^g, Christine Clark ^h

^a Department of Imaging Science and Biomedical Engineering, University of Manchester, Manchester, UK

^b Department of Electronic Systems Engineering, University of Essex, Colchester, UK

^c Computer Science Department, University of Western Ontario, London, Ont., Canada

^d Department of Computer Science, Colorado State University, Fort Collins, CO, USA

^e PerkinElmer, Sturbridge, MA, USA

^f Centre for Medical Image Computing, University College London, London, UK

^g Siemens Corporate Research, Princeton, NJ, USA

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Abstract

It is frequently remarked that designers of computer vision algorithms and systems cannot reliably predict how algorithms will respond to new problems. A variety of reasons have been given for this situation and a variety of remedies prescribed in literature. Most of these involve, in some way, paying greater attention to the domain of the problem and to performing detailed empirical analysis. The goal of this paper is to review what we see as current best practices in these areas and also suggest refinements that may benefit the field of computer vision. A distinction is made between the historical emphasis on algorithmic novelty and the increasing importance of validation on particular data sets and problems.

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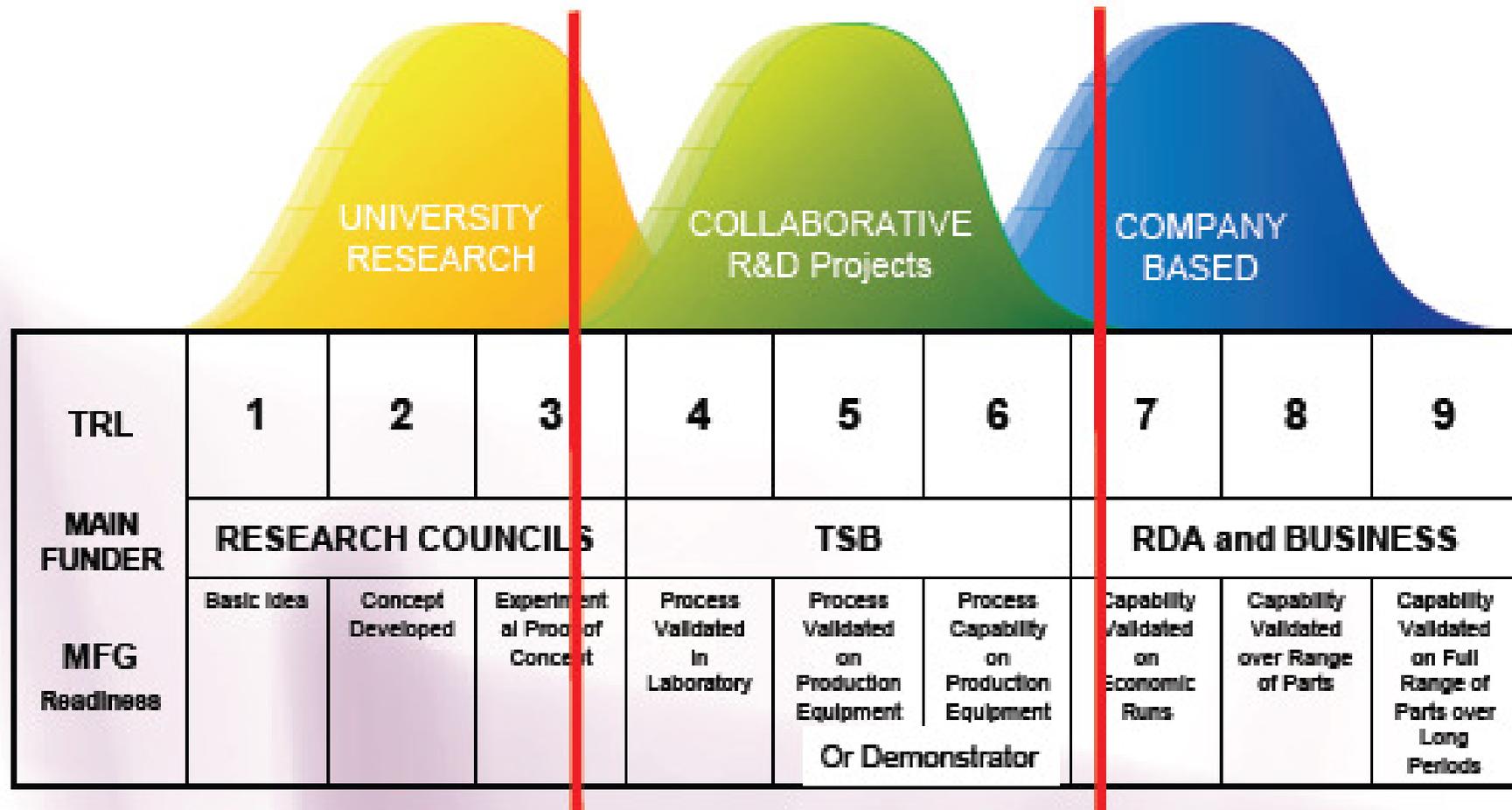
Keywords: Performance assessment; Performance evaluation; Vision system design

from EU project...also for biometrics, tracking, speech, machine learning...

Roadmap for Artificial Cognitive Systems

- Problematic so far: preferred term “challenge”
- But see look at the Graphene community:
 - **Q: What do you think graphene will be used for first?**
 - A: “Two or three months ago, I was in South Korea, and I was shown a graphene roadmap, compiled by Samsung. On this roadmap were approximately 50 dots, corresponding to particular applications. One of the closest applications with a reasonable market value was a flexible touch screen. Samsung expects something within two to three years.” Andre Geim
- Note their semiconductor heritage

Technology readiness levels



NASA, UK government (technology strategy board)

3. Public outreach and the cognitive zoo

- developing appealing cognitive systems.
- allowing the cognition community to show-case work
- connect to other communities
- demonstrate key functionality in diverse environments
 - eg interaction, affordances, learning and play, robustness, etc



Robotville at London Science Museum nov 2011