Echoes meeting – 25th January, London Knowledge Lab

10.30 am start, ended at c. 5pm

Present: Karen, Nicola, Tim, Wendy, Helen, Genaro, Kaska, Judith

Apologies: Oliver, Annalu

Session1: Welcome and Introduction of the new partners (10.15am – 11.00am)

Kaska welcomed everyone, in particular the new participants, Karen, Tim and Nicola, and Genaro as the new RA.

Nicola: riddles, collaboration between children, tasks to consider, recognition of interests, communication

Karen: e-learning for children, communication issues for children with AS

She described the time constraints on the grant, with a view to producing a proposal for a call in May/June.

The goals of today are to:

Generate:
- concrete research questions
- theories and expertise
- technologies that we want to consider as components of the proposed system
- uncertainties, worries, anticipated problems
- tasks for the chidlren to engage in

To produce a map of the relationships between:
- research questions and theories + areas of expertise
- research questions and our technological ambitions in relation to Echoes

**Session 2: Collaborative mapping of Echoes knowledge and procedures
Summary tasks: identify difficulties, knowledge gaps, questions**

2A. Genaro: reminder of known questions, technology, theories, areas of expertise

i. Interests in computer science, in affect in general
In life social skills are important, for education in particular.

Skills useful for social interactions in group and to create process of reflection in social interactions or in education.
Can be conducive for abstract thought.
When people do not have social skills – why? Nature or nurture?
Can we use technology to help them learn how to learn social skills?
Nature of echoes.
Main research questions for me:
What is the nature of this technology? Relates to specific children.
ASD – very wide spectrum of problems. So where do we focus in this.
Also came across evidence that spectrum of disorders can be genetic – neurological basis – mirror basis recently European researchers apparently pinned down where in the brain this takes place.
If we develop technology we have ot take account of theory of mind and theory of intentions.
= understanding of echoes so far and issues of importance to Genaro

ii. Theories identified in literature so far:

Theories and areas of expertise:

Theories of mind
Collaboration
Intention
Verbal Communication
Recognition of emotion
ASD and sensory issues
Eye tracking and autism
Multi modal interface
Socio-cognitive abilities
Embodied user interfaces
Video games design by children
Terminology and label
User-centre design
Narratives
Inter-subjectivity
Teaching, Learning and Pedagogy
Cultural interpreters to enable and help
Interaction with other cognitive and physical impairment
Accessibility and Augmented and Assisted Communication

Discussion:

How do we talk about people with ASD?

If technology can work for those with ASD will it work for everyone?
Or will it mean that we do not get past the more limited needs to provide for those that are typically developing?
Will the challenge of dealing with hard cases cause us to fail before we start?
Wendy: argues that if we design to cater for more limited group we will provide better basis also for TD children.
Solution may be to try and focus where to look.
Karen: are we looking at communication, or language? Skills such as repriprocity of language? Are we looking at social interaction or social skills? Lot already looking at social skills – so more interesting to look at social communication. Communication is not just language – it is also gesture, and non-verbal language. So not just verbal language.

General agreement: focus on communication, and verbal and non-verbal

Nicola's background and interests:

Work done: [see her notes also]
Grants – social understanding of mothers language. How does mother's language help children understand social tasks. Mother who talk about mental states help develop…. [involved coding language, psychol perspect.]
Riddles – technology to support collaboration and language play.
Non-literal use of language (as in standup).

Issues of engagement and enjoyment as well.

Riddles: gestures and interest in TD children explaining jokes. Analysis of language suggest specific sorts of language lead to improvement in text comprehension. Use of gestures may also help predict how to improve. Research can tell you what children can understand even when cannot articulate, and also how it helps them to think. Also relation to signing.
Verbal language may not be main issue, and gestures play role.

Pragmatics of language may be best area to focus: reciprocity, attention, etc.

Looking at cognitive and language games: pragmatic aspects of language seems important and seems to fit partners.

Comments:

Helen – relates to Annalu – not just to fit pre-stored words.

Oliver/Kaska- to provide flexibility to explore language and communication.
Teaching language skills: if cannot do it **telling them** may not fix it.
Important to provide opportunities for exploration.

Kaska – to provide opportunites for exploration and language play. Providing sense of empowerment.

Wendy: child driving the technology not technology driving child; open-ended, improvisational, child first and tech respond

Nicola (contd):

Had project where got chance to re-design playground to principles set eg place to observe, lead into other activities, circling

Concern: language impairment – issue of children with ASD – while children in Standup had low ability to communicate but high motivation, ASD children may not have same motivation – so motivation an issue
Can we motivate child through the task? Simple reward may not be adequate.

Comments:

Wendy: when there is a mutual goal there will be motivation.
Judith: focus more on intrinsic motivation – focus on having to collaborate in order to share goal
Tim: if they had to engage with a computer agent this may be less of an issue.
Nicola – may get more interaction with ECA

Tim – argument for less realism?
Kaska/Judith: issue of believability
Tim – reason for using less- realistic avatars
Issue of transfer?
What does lit say about realism v not in pedagogical agents?
Wendy: also issue of not distracting – keeping simple leaves room for communication – is too much resource on environment then can be too distracting.
Genaro: TD children may prefer character-like animation rather than realistic ones.

Nicola – for ASD not just delayed but different.
Kaska: issue of pretence – children like pretending to be other characters when engaging in interactions; so may have improvisation and also take role of character in interaction.
Genaro – may be a good thing for identifying with another's goals, etc.
Kaska: child can see themselves as an equal in interaction

Discussion moving towards general idea of interaction where child takes role of character.

Karen: mirroring – 'musical interaction therapy' use medium for child to take lead and adult mirrors them.
Wendy: staging a mirroring process
Helen: allows child to see externalisation of selves – may learn from it even if they do not see it as themselves.

Nicola (contd):

Task used on previous project – communication game, when communication is ambiguous – set of cards, barrier and other has set of cards – speaker says 'man with flag' – partner has to show card – set it to have ambiguities.
Issues of conversational alignment (Tim: Edinburgh maptask).
In TD what fosters the ability to do this task (Liz Robertson?).
Children who were best were those who had mother who were explicit – e.g. "Do you mean this or that?" rather than "I do not understand". Lot of scope for intentional misunderstanding

Helen: could have child direct agent and get it to intentional misunderstand – may lead them to do something silly/unexpected.
Nicola: issue of whose fault is it when they get it wrong?

Kaska: in relation to task: something simple – for ASD what task is appropriate, but challenging enough
Nicola: tasks v structured explorations. How structured, what kinds of structures?
Wendy: how also to make it customisable to the individual – meaningful and interesting to learner. Canvassed opinion from colleagues – 'has to be interesting' – but what ASD finds interesting may not be so predictable. How to adapt to, maintain and support that interest will be a challenge.
Karen: could also be a task that has an immediate effect. Picture exchange communication system. Introduces reciprocity. Think of some elements that could be useful. Exchange symbol for object, to get what they want. Would suggest it as a game.

Discussion seems to be moving towards idea of a game where the learner drives character to obtain objects; could also have wilful misunderstanding and ambiguity in controlling character, or to have to interact with others to achieve goals.

Judith – communicate with tokens or objects, as Oliver suggests.

Karen's background and interests:

From Social Anthropology and Ling to start, then teacher training, then children with Sever learning difficulties, then moved to autism. Dissertation on communicative interactions in the classroom – found those with autism

communicated more spontaneously with settings where there is structure, and better with adults. With the computer it is more predictable, and turn taking more obvious (Wendy). Also issues of peer-to-peer communication (Kaska).

Moved then to outreach service supporting teachers in supporting Autism; then Birmingham, to provide support to develop web based course as distance learning to support those involved in learning aimed at practioners or parents working with autism; part of autism studies team; included multi-modal interaction including discussion. Will now have autism centre in education ?research.
PhD looking at discussions online using discourse analysis, relates to pedagogy, how people learn, in relation to autism and social communication.

Large group in Birminham in relation to special needs and autism. Lot of skills we could draw on. She has worked with Wendy, developed research for GPs and primary care practioners as a web based resources (across Scotland); all related to autism, also ASD research in N.Ireland.

Tim's background and interests:

Playing with social attention – Laser eyes

Social attention, relating to ASD primarily, typically with adults
Background in visual cognition of films
Research on HCI suggest that more accessible websites work for everyone
Gazeatron – looking at where people look when watching films. Importance of social attention and aspects of scene. Eye movements as way of accessing this. Gaze typically moves back and forward to follow conversation. If not looking at it do not directly process it.

Still in early stages of research in following gaze movements – may not simply be the voice, or anticipating the next person speaking. May not just be moving to focus on verbal communication. People mostly only remember what they have fixated on. Eye movements may be rapid so may fixate on a lot. 3 types of eye movements: fixation, saccades, pursuits. Also important are eye blinks and pupil dilation. Want to know all these things to permit you to infer things about the state of the viewer. If they move eyes between various objects, can assume a sequential thought process – so if move between speakers can infer they are following the interactions. Duration of fixation related to how well processed. Can also use blinks and pupil dilations as indicators of processing.

Where do we look in scene? Even is free view scene, TD will looks at people, faces first; if faces have triangle of eyes and mouth, where they will focus if little time to process.

Social attention:

Sensitivity to social cues e.g.
- gaze shifts and head turns
- facial expressions
- pointing gestures
- gestures and posture

Tells us:
 - intentions of others
 - emotional state
 - social status
 - covversational cues

Intuitively done by most TD viewers

Those with ASD they do not attend in same way:

Faces, identify expression:
TD – triangle;   ASD look at unrelated details, bizarre eye movements
Only difference in recognising emotion was in interpreting fear

Explore face:

If look at dynamic scenes, TD focus on eyes; ASD fixate on wrong part of scene, and watch mouths rather than eyes. But not a lot of research yet – how strong is convention look at eyes v. mouth – some viewers may be mouth watchers. Autistic viewers may be over sensitive to lower level features such an movement, but if trying to pick up on extra-vocal cues, have to split attention. (May look at mouth because speaking or moving).

Not a lot of work of exactly how long and where – need to develop baseline comparisons on where people look, and averages and standardise this. Have to be careful how to generalise.
Genaro: may be cultural differences.
Tim – not a lot of empirical data. Problem of having to filter empirical data if bombardment of this – sensory issues, processing more information at once.

Some computer based scenarios can be more stripped down to avoid distractions, and then gradually increase it.
Simon Benn Cohen? – differences in infants in eye gaze in gender (Karen).

Impaired social monitoring: TD will follow and look for response; ASD will follow who is speaker (and not anticipate and look for response).
Over prioritisation of physical cues – ASD will look at movements, not wider implications in social context.

Over prioritisation of verbal scene content – TD following pointing gesture. ASD misses it.

May be due to lack of Top-Down control.
Have top-down – cognitive control of attention based on vewing stategies task demands

Bottom-up – use low level visual cues such as motion and control and colour to control attention.
 - preference for bottom up by ASD not due to extra sensitivity (missed rest of slide)

Echoes – can top-down control be developed?
 - can high functioning autistics develop coping strategies ie mouth watching

Could awareness of social cues be developed?
 - gaze reactive game
 - success requires social monitoring
 - beginners attention is manipulated
 - assistance gradually moved
 - visually rich – or abstract scenes – to encourage transference?

Feasibility of eye tracking
 - can be non-intrusive
 - camera embedded in screen – can plus into any computer - can use with physical disability - £15K
 - realise do not need high resolution stuff
 - pretty high cost just now - £2K - £30K – but may be c. £200 within 3 years….

Technical issues:
 - needs to be cheap robust and unobtrusive
 - can even calibrate with infants
 - need to know where they are looking – so can see where look on screen, need to break screen into regions so know what it is related to there (straightforward if have artificial scene)
 - need to infer cognition from gaze position
 - react to it

Need social engaging scenario
Cogntive modelling
Conversational and visual fidelity
?? other limitations not known because not tried before.

Summary:

- Eye movements as window on real-time cognition
- Attending to social cues allow us to function socially
- Viewers with ASD display irregular eye movements
- May be able to develop through play
- Gaze-reactive social simulator
- Technological possible
- Only limit is our imagination
- any ideas….

Kaska: if they learn to focus on pertinent cues, will it improve interaction?
So will any learning transfer?

Genaro – use with children? Tim: yes – can have many intuitive applications of this.

Karen: University of Valencia – Gerado Herrera – developing symbolic play through virtual reality – objects representing other objects in play

Judith taking over here:

Wendy: Tangible Interfaces

My notes;

Direct manipulation of interfaces – has summarised research

Cooperative work and livid Cognition

Taxonomy enables users – see refs!

Bodily interaction, control of the environment

[summary of whole bunch of related research in relation to role of tangible interfaces/interaction systems]

Karl Wall London Inst of Educ PhD thesis on gestures and ASD.

Physical and social interaction is very relevant

go to reactive colours on youtube

Providing facilitator tools for use in structured activities
Use in 'free play' sessions, but still relate to the curriculum

Use of sensors by adults with ASD to make them more self aware
of their emotional states – Wendy Lawson – eg pulse watch to monitor

Journal to Wild Divine – sensors placed on fingers in game - teaches breathing and other stategies to cope with stress – does have current use in schools – speak to Karen – anecdotal at present. Research project on it?

My synthesis of some of the discussion:

Features we seem to be saying would be desirable in the technology we develop:

Pragmatics of language
Target is ability to engage in social interaction
Communication, verbal and non-verbal behaviour
Focus on exploration and play
Within a structured environment
Child driving technology
Providing facilitatory tools for use in structured activities
Use in 'free play' sessions, but still relate to the curriculum

Goal: Usage of verbal and nv communication to facilitate social interaction

Could be game and learner drives character to obtain objects; could also have wilful misunderstanding and ambiguity in controlling character, or to have to interact with others to achieve goals.