A Motivational Dialogue System for Children's Language Development

Darren Atherton (d.a.atherton@liverpool.ac.uk)
Floriana Grasso (floriana@liverpool.ac.uk)
Department of Computer Science, University of Liverpool, UK

1 Introduction

Acquiring language at an early age is heavily impacted by multiple factors, one of which is exposure to language [6, 3]. Persuasive Technology [5] is likely to have a significant impact on the amount of communication taking place between parent and child, which in turn would result in an increase in the *quality* of language acquisition by the child. This study aims to incorporate Persuasive Technology into a digital intervention for children's language in order to boost the parents level of engagement with their child.

Persuasive Technology and digital interventions traditionally take a 'one size fits all' approach (as opposed to tailoring motivation to individual users) and is often created when the designer knows the points of persuasion or motivation in advance, with the intention to motivate toward a behaviour by providing the same information (e.g. feedback/goals) to individuals who are all motivated differently; that is, they have different values, perspectives and history with the behaviour. In domains such as parenting, a person's lifestyle, background and beliefs can inform to what extent and in which ways they perform language boosting [12, 7], suggesting it is important to personalize approaches to motivation/advice giving to the individual.

Existing digital interventions typically function as a website or application, however we suggest that an intervention should function as a *conversation* wrapped inside a website/application, and so we need to model a two-way interaction between motivator and parent in order to react, personalise and motivate individuals towards behaviour change. To accomplish this, we are attempting to formalise a motivational dialogue system which focuses on providing rich behaviour suggestions supported by evidence, discussions about behaviour and motivational argumentation in an automated, intelligent manner.

The research is being undertaken in the context of the Language 0-5 Project [9], a project run by the International Centre for Language and Communicative Development (LuCiD) [8] to support the Babytalk mobile application [10]. Babytalk is a digital intervention focusing on boosting language acquisition by providing evidence-grounded suggestions and monitoring of language.

2 Background

Argumentation often occurs between agents using a dialogue mechanism. Walton and Krabbe [13] characterise six primary dialogue types - information-seeking, inquiry, persuasion, negotiation, deliberation and eristic (although many other types exist, some of which are a sub-type of a primary type). Existing dialogues are often very rational, and typically maintain focus on a truthful, *logical* conclusion when participants argue. In this study, we propose a new type of dialogue - a 'motivational dialogue' which focuses on the individual, their values and perspectives and grounded in a Value-based Argumentation Framework (VAF) [1].

The dialogue is inspired by existing theories and techniques of motivation and behaviour change. [2] suggests that understanding these behaviour change theories is critical to changing behaviour. One prominent behaviour change theory is the *Transtheoretical Model of behaviour change (TTM)* [11]. This theory is also known as the 'stages of change' theory, as it proposes that people advance stage-by-stage towards modifying their behaviour, through stages such as *pre-contemplation*, *preparation* and *action*. The TTM recognises that there are varying levels of 'readiness' for a person to perform tasks to help achieve the behaviour, which can inform the ways in which motivation can be provided. One aspect of behaviour in the TTM is that an individual can shift in *either* direction through the stages (i.e. they can move further from behaviour change, due to some barrier), therefore it is important to ensure that motivation is built up and progress is monitored.

3 Motivational Dialogue system

Since we propose that our intervention should function as a *conversation* wrapped in an application, the system has several different aspects. This study will attempt to combine traditional persuasive technology (interface/nudge based) approaches with computational argumentation approaches by incorporating the dialogue system directly into application interactions. The idea is that we can create a motivational interface supplemented by the motivational dialogue, which allows for more complex reasoning and automated interactions. As we are utilising a dialogue, we need will explore how dialogue 'moves' correspond to certain application interactions, and how to design an application interface which accurately portrays dialogue moves performed by both the application and the individual (parent).

The formalisation of our motivational dialogue is in progress. We are first attempting to characterise what it takes for a dialogue to be motivational. In the case of a motivational dialogue, there are two participants, who have a symmetry of goals. The recipient is often asking for the motivators help. While the recipients *desire* to achieve the goal already exists, the *drive* is often not, and this is where the dialogue must provide motivation. The motivator and the recipient have already agreed on their goal (in our case - increasing parent-child interaction), and are exploring the best way to go about achieving it - making the goal (a behaviour) easier to do. We are utilising the dialogue to execute a 'conversation' between us (the motivator) and the parent (the recipient).

We are attempting to create a notion of meaningful dialogue history with respect to 'conversations'. One of the key differences between a motivational dialogue and its closest counterpart, a persuasion dialogue, is that motivation builds up over time (as seen in theories such as Cognitive Dissonance [4]). This means that a single dialogue phase on its own does not have enough meaning, whereas a series of interconnected phases which can reference each other is essential. One of the challenges of the study is to find ways in which we can represent the *meaning* of each conversation, so that it can be referenced and built upon in future conversations.

Each dialogue phase is centered around some topic, and has the same basic structure and purpose - it exists to define a single part of the overall conversation, and is focused on a single goal (e.g. reading bedtime stories with the child). The separation of phases, together with the history mechanism, should allow the motivator to record the outcome of the phase, the motivational argumentation path taken, and what the situation was at the time (i.e. the parent's current values, arguments etc.). These details give meaning to the phase, and if the motivator can 'liken' one situation to another, then it has an increased change of assessing which motivational strategies will work (or won't work) in future situations.

Arguments within the dialogue will be combined with moves generated from within an overall plan for the parent, which will be based on the transtheoretical model to determine which moves are put forward by the motivator, depending on the parent's current stage of change.

References

[1] Trevor Bench-Capon. Value based argumentation frameworks. *arXiv preprint cs/0207059*, 2002.

[2] Samir Chatterjee and Alan Price. Healthy living with persuasive technologies: framework, issues, and challenges. *Journal of the American Medical Informatics Association*, 16(2):171–178, 2009.

[3] Susan Curtiss. *Genie: a psycholinguistic study of a modern-day" wild child"*. Academic Press New York, 1977.

[4] Leon Festinger. *A theory of cognitive dissonance*, volume 2. Stanford university press, 1962.

[5] Brian J Fogg. Persuasive technology: using computers to change what we think and do. *Ubiquity*, 2002(December):5, 2002.

[6] Betty Hart and Todd R Risley. *Meaningful differences in the everyday experience of young American children.* Paul H Brookes Publishing, 1995.

[7] Janellen Huttenlocher, Heidi Waterfall, Marina Vasilyeva, Jack Vevea, and Larry V Hedges. Sources of variability in childrens language growth. *Cognitive psychology*, 61(4):343–365, 2010.

[8] LuCiD. International centre for language and communicative development. http://news.liv.ac.uk/2014/03/24/9m-to-understand-how-children-learn-to-talk, 2014 (accessed January 6, 2015).

[9] LuCiD. Language 0-5 project. http://www.language05.co.uk, 2014 (accessed January 6, 2015).

[10] LuCiD. Babytalk. http://www.lucid.ac.uk/what-we-do/technology/babytalk-app, 2015 (accessed April 17, 2015).

[11] James O Prochaska and Wayne F Velicer. The transtheoretical model of health behavior change. *American journal of health promotion*, 12(1):38–48, 1997.

[12] Meredith L Rowe. Child-directed speech: relation to socioeconomic status, knowledge of child development and child vocabulary skill. *Journal of child language*, 35(01):185–205, 2008.

[13] Douglas Walton. *Commitment in dialogue: Basic concepts of interpersonal reasoning.* SUNY press, 1995.