The Interpretation of Plural Pronouns in Discourse: The Case of *They*[*]

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Abstract

This paper presents an experimental study on the interpretation of plural pronoun *they* in discourse, and offers an answer to two questions. The first question is whether the anaphoric interpretation of *they* corresponds to that of its antecedent NP(*maximal* interpretation), or by the "whole" previous sentence (*reference* interpretation). The second question is whether speakers may access only one interpretation or both, although at different "moments" in discourse. The answers to these questions suggest that an accurate logical and psychological model of anaphora resolution includes two principles. A first principle finds a "default" interpretation, a second principle determines when the "alternative" interpretation can (and must) be accessed.

1 Introduction

There is a general consensus that plural pronouns denote plural referents[1]. However, there is little agreement on their *anaphoric potential*: how plural pronouns are interpreted against previous discourse. The following examples illustrate the nature of this debate:

(1) *Some boys* are having dinner. *They* are eating a pizza

(2) *The boys* are having dinner. *They* are eating a pizza

In (1), the indefinite NP *some boys* denotes an unspecified amount of unidentified boys who are having dinner. If we have Mario, Luigi and John as boys in the context, then *some boys* may denote Mario and Luigi as a pair, but not John. In (2), the definite NP *the boys* denotes the "full" group of boys who are having dinner: Mario, John and Luigi. In both cases, NP and determiner combine to denote a referent which includes more "basic" discourse referents as its parts.

The crux of the debate lies on how speakers interpret *they* in these examples. Some approaches assume that only the antecedent NP matters; others, that the rest of a sentence also contributes to this interpretation. A third group assumes that both options are available, but determined by Grammar. Few experimental works offer evidence in favor of one of these approaches. Studies on singular pronouns in intra-sentential contexts abound in the literature on Language Acquisition and Processing (Lukyanenko et al., 2008; Elbourne, 2005b; Koornereef, 2008), and in the NLP literature (Branco, 2005). However, few or no works attempt to study plural pronouns such as *they*, especially in inter-sentential contexts.

The main goal of this paper is to offer experimental data on the interpretation of plural pronouns (e.g. *they*) in inter-sentential, or *anaphoric* con-

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[1]We follow the dynamic semantics literature and label "referents" the singular and plural individuals denoted by Noun Phrases (NPs) (Kartunnen, 1976; Heim, 1982; Kamp, 1981; Kamp and Reyle, 1993).

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texts[2]. These data, in turn, are used to outline which models of anaphora resolution, among current approaches, appear to correctly capture how speakers resolve anaphoric relations in discourse. We focus on two sub-goals. First, we investigate whether speakers interpret *they* in discourse as denoting "all" or the "relevant" referents denoted by its anaphoric antecedent. Second, we investigate whether speakers may change their interpretation of *they*, if the extra-linguistic context allows this change.

Overall, we address the following general question: which is a logical and psychological model of anaphora resolution, that can predict how speakers interpret plural pronouns in discourse. Anticipating matters a bit, we suggest that anaphora resolution involves two components. The first component establishes the anaphoric relation between a pronoun and its antecedent, so that a pronoun receives the same interpretation of its antecedent, whether it is a maximal or reference one. The second principle allows to change this relation, when the context of discourse licenses this change. So, we suggest that theories of anaphora resolution that include these components are more accurate than theories that include only one component.

The paper is organized as follows. We define some general assumptions on plural NPs and *Generalized Quantifier* Theory (section 1.1) shared by all theoretical approaches. We discuss three theoretical approaches to plural pronouns (section 1.2). We then present the experiment that tests these three approaches (section 2). We discuss the results, and their theoretical import, in the conclusions (section 3).

1.1 Background: Plural NPs and Generalized Quantifier Theory

We start our discussion from theories of Plural Nouns. Theories of plural NPs assume that these terms denote *mereological structures*, power-sets generated by the set of referents in the denotation of the corresponding singular NP (Schwarzschild, 1996; Chierchia, 1998; Link, 1998; Winter, 2001). If a singular NP such as *boy* denotes Mario, Luigi and John as distinct referents ($\mathbf{boy}' = \{m, l, j\}$), then *boys* denotes its corresponding power-set $^*\mathbf{boy}'$, generated by the * (star) operator[3].

Each of the sub-sets in the denotation of a plural can be treated as a distinct referent, since the two notions are equivalent in a lattice-oriented approach (e.g. Mario, Mario and Luigi as a pair). Plural pronouns, being morpho-syntactically plural, denote a plural referent, in part determined by the interpretation of previous plural NPs, and the determiners they combine with. We turn to GQ to spell out the relevant details on this latter process.

GQ theory assumes that English sentences can be assigned the syntactic structure $[[DetNP]VP]$ (Barwise and Cooper, 1981; Nouwen, 2003; Szabolcczi, 2010). The NP is in the *restrictor* position, since it restricts the range of entities quantified over. The VP is the *Nuclear Scope* position, since it introduces the minimal scope of the quantifier. In (1), the first sentence has the structure [[*Some boys*] *are having dinner*]; *boys* is NP in the restrictor, *are having dinner* is VP in the nuclear scope.

The relation $Det'(A, B)$ represents the interpretation of this structure. A Determiner denotes a relation between sets (i.e. Det'), combined with a cardinality condition on this relation. For instance, the relation $Some'(A, B)$ roughly stands for a relation between A and B, which includes at least one referent in its denotation. The relation $The'(A, B)$ roughly stands for a relation in which there is a unique maximal individual in its denotation. While A is the set of boys, B is the set of eating entities in discourse.

An important property of quantifiers is *conservativity*. It states that this relation is equivalent to $Det'(A, A \cap B)$: in words and using (1) as an example, that some boys are boys who are having dinner. The set A is known as the *maximal set*, here the set of all boys under discussion. The $A \cap B$ is known as the *reference set*, in this case the set of all boys who are also having dinner. The three sets of approaches sketched in the introduction differ on which sets acts as the anaphoric interpretation of *they*, as we explain in the next section. A note: we will respectively call A and $A \cap B$ the *maximal referent* and the *reference*

[2]We leave aside *referential* pronouns, pronouns that appear without a previous explicit antecedent (e.g. *they* in *they are eating a pizza*, (Elbourne, 2005a; Elbourne, 2005b; Schwarz, 2009).

[3]In extensional format, this set (a *full join lattice*) is: $^*\mathbf{boy}' = \{\emptyset, m, l, j, \{m, l\}, \{j, l\}, \{m, j\}, \{m, l, j\}\}$. We follow Landman (2004) and include the empty set in the denotation of plural terms.

referent, to keep terminological differences between frameworks at a minimum. Let us now discuss the three sets of approaches to plural pronouns and their anaphoric interpretation.

1.2 Three Sets of Theories

1.2.1 The First Set: Maximal Approaches

The first set includes approaches that treat pronouns as covert definite descriptions. Two variants of this approach are usually known as the *E-type* or *D-type* approach. They vary in syntactic but not semantic assumptions, so they can be "merged" in one approach (Elbourne 2005a, 2008). The basic intuition behind these approaches is that *they* in (1) can be treated as standing for the definite description *the boys*, which then takes a Quantified NP as its anaphoric antecedent in previous discourse (e.g. *some boys*, *the boys*).

Given these assumptions, these approaches predict that *they* denotes the maximal referent. So, in (2) *they* denotes the plural referent $A = \{j, m, l\}$, the referent denoted by *the boys* (Mario, Luigi and John as a trio). In (1), it denotes the plural referent $A = \{m, l\}$, denoted by *some boys* (Mario and Luigi). For this reason, we label these approaches as the "Maximal" approaches.

1.2.2 The Second Set: Reference Approaches

The second set includes approaches that vary in syntactic and semantic details, as they either assume that pronouns denote bound variables (Geurts, 1999; Kamp et al., 2005; Kibble, 1997; Heusinger, 2003) or identity functions (Jacobson, 1999; Jacobson, 2004). They all converge on one assumption, that anaphoric pronouns are interpreted as denoting the reference referent individuated by the previous sentence. We focus on DRT's analysis, for the sake of simplicity.

Let us take (1) as an example. According to these theories, the pronoun *they* in (1) denotes a plural referent. The VP *are having dinner* restricts the interpretation of the antecedent of *they*, the quantified NP *some boys*. The whole sentence denotes the reference referent, the set $A \cap B$: the set of boys who are having dinner. In DRT, this is roughly represented as the Discourse Representation Structure (DRS) $[\{Y, x\} : Y = \Sigma x, B(x)]$, in which a plural referent "Y" is identified with another plural referent, represented as Σx[4]. In words, the pronoun *they* is interpreted as denoting those boys who are having dinner and are also having a pizza. This is represented via the anaphoric relation $Y = A \cap B$, with the plural referent Σx standing for A. Given these assumptions, these approaches predict that *they* denotes the reference referent. For this reason, we label these approaches as the "Reference" approaches.

1.2.3 The Third Set: Flexible Approaches

The third set includes frameworks that propose that both the maximal and reference interpretation are possible, for pronouns (Chierchia, 1995; Nouwen, 2003; Brasoveanu, 2008)[5]. Two assumptions play a role in determining which interpretation speakers choose.

First, formal properties of the antecedent NP determine which referent is anaphorically identified with the interpretation of a plural pronoun. Strong determiners such as *the* select the maximal referent interpretation, weak determiners[6] such as *some* select the reference referent interpretation.

Second, the "alternative" interpretation of a pronoun is accessed when the "default" one cannot be accessed. One example is the following:

(3) The boys went to the pub, the girls went to the pool. *They* took a schooner of Fat Yak

In (3), *they* refers to both (all) boys and girls, by default. However, since this interpretation is contradictory, the alternative one is selected; *they* denotes the "people" that could actually go to the pub and grab a schooner. This is possible only if *they* can be interpreted as either denoting the maximal or reference referent, but not if it has a "fixed" interpretation. For this reason, we use the "Flexible" label for these approaches.

[4] Informally, a DRS is a combination of one or more "conditions" (properties such as $B(x)$, relations such as $x = y$) and a universe of discourse (the set of referents {Y,x}). Conditions are interpreted conjunctively. The symbol Σ represents that x is a mereological sum of referents, i.e. a plural referent. The notation used here is roughly the one used in Geurts (1999).

[5] We leave aside a discussion of *Centering Theory*, which offers little or no treatment of plural pronouns (Nouwen, 2001; Poesio et al., 2004).

[6] Weak determiners are determiners that can occur in *there* sentences, while strong determiners cannot (e.g. *there is some boy waiting* vs. **there is every boy waiting*) (Barwise and Cooper, 1981).

1.2.4 Three Approaches: The Predictions

The predictions of these approaches on the interpretation of *they* in discourse can be summed up as follows. The first set, that of Maximal approaches, predicts that *they* always denotes the maximal referent that is denoted by its antecedent NP. The second set, that of Reference approaches, predicts that *they* always denotes the reference referent, that is denoted by the previous sentence. The third set, that of Flexible approaches, allows both interpretations. One interpretation acts as the "default" interpretation, and may be either a maximal or a reference one. The other is the "alternative" interpretation, and must be properly licensed in context. The experiment described in the next section offers evidence testing which of these three approaches seems to make the correct predictions on the interpretation of *they*.

2 The study

2.1 Participants

The experiment involved adult participants (N=25). All participants were native speakers of English, undergraduate students of Psychology, and received course credit for their attendance. Between one and four participants attended each session, for a total of twenty minutes of experiment time.

2.2 Procedure

The experiment involved a variant of the *Truth-Value Judgement Task* (TVJ task) (Crain and Thornton, 1999). Most experiments involving this test are used to test children. However, given its flexibility, this task can be used to also test adults. A brief presentation of the task will help us in offering a reason for our choice. One type of a standard TVJ task, the so-called *description mode*, involves two experimenters. One experimenter acts out the scenario and narrates the events. The other experimenter controls a hand-puppet (e.g. Kermit the Frog), which is described as observing the events of the story with the participant.

At the end of the story, the puppet asks a question about the story to the participant, to be sure that he has understood the events he has observed, so he offers a yes-no question to the participant regarding the story. After a participant offers an answer, a follow-up question is usually offered, in order to test whether an offered answer is based on a correct understanding of the events described by the story.

When a TVJ task experiment involves yes-no questions, the story should describe events in such a way that both a "yes" and a "no" answer should be possible answers. However, only one of the answers correctly matches the outcome of the story. This condition is known as the *Condition of Plausible Dissent* (Crain & Thornton 1995: chapter 5).

An example is the following. One experimenter narrates a story of five horses involved in a jumping contest. Four horses jump successfully, one trips and fails. Another experimenter, as Kermit, asks (4):

(4) Has every horse jumped over the fence?

Assume that the participant has a correct interpretation of *every* as denoting the universal quantifier. Then, she will likely offer a "no" as answer, since one horse did not complete the target task. Although a "yes" answer could have been entertained, at some point (i.e. the fallen horse almost completed the jump), the end result made only the "no" answer as the correct one. The TVJ task thus allows a simple way to test grammar competence in a relatively simple and effortless way. The specific nature of our empirical questions motivated a few changes to the task. Our changes to the standard task were as follows.

First, our two experimental questions required that participants could choose between either interpretation, possibly *changing* interpretation in the opportune context. So, the experiment included a *sequence* of three stories. The first story tested if participants could access both interpretations. The second story tested if participants could change their initial interpretation, in an opportune licensing context. The third story tested if participants maintained the "new" choice, if the context did not license a further change of interpretation.

Second, we prepared a power-point presentation depicting this sequence, instead of acting out the stories. Each slide depicted a single event involving one or more characters, with the text accurately describing this event. At the end of each story Mr. Little Bears, a character taking the role of Kermit as the puppet, appeared in a slide and offered a question to the participants.

Third, participants received an answer sheet before the start of experiment, on which they were invited to write down their answer by circling either a "yes" or "no" answer, for each story. Participants had to write down an answer after each of Mr. Little Bears' questions, story by story. After the experiment, the answers sheets were collected, and two follow-up questions were offered. A first question asked why they offered their answer in the first story. A second question asked why they offered their answer in the second and third story.

There were two reasons for collecting follow-up answers in this way. A first reason was that, since participants had three distinct but related answers, asking a follow-up question after each story would have likely made the participants aware of their own choices. This awareness could have biased the results in one way or another, so we removed this potential source of confounding. A second was that, via an "open" answer, it was possible to better understand the reasons behind participants' choices. Answers were coded according to the characters that motivated a given answer. Specific details are offered in the next section.

2.3 Materials

The stories involved five characters from the *Thomas and the tank engines* line of toys. This list of tank engines included Thomas, Duncan, Spencer, Diesel 10 and Arthur. The other recurring character, Mr. Little Bears, was introduced as an amnesiac bear that was going to watch the stories with the participants. Because of his bad memory, he had to ask a question after each story. Other characters were temporarily involved in each story. The five tank engines remained the main characters in all three stories.

The structure of the stories was as follows. In the first story, the tank engines had to deliver a jewel to Pikachu the Pokemon, as their first job of the day. Each of tank engines individually went to Pikachu's station but Spencer, during his trip, decided to stop at the local aquarium and ended up not delivering his jewel to Pikachu, unlike Thomas, Duncan, Arthur and Diesel 10.

Mr. Little Bears appeared in the next slide and offered a question. This question followed a sentence that introduced an anaphoric antecedent for *they*. We chose the definite NP *the engines* as an antecedent, for the following reasons. As a strong determiner, *the* should license the maximal referent interpretation as a default (Barwise and Cooper, 1981; Nouwen, 2003). Participants could also have chosen the reference referent interpretation may also be licensed, if they could access the alternative interpretation. Hence, a "yes" or "no" answer easily pointed out which interpretation participants chose.

The first target question was (5):

(5) "It's nice to see that *the engines* are working hard, but I am not sure about one thing: Have *they* gone to the station?"

If participants would have interpreted *they* as denoting the maximal referent, they would have answered "no". One engine, Spencer, did not reach the station. If participants interpreted *they* as denoting the reference referent, they would have answered "yes". The the other four tank engines reached the station.

The second story described a similar complex set of events, although the engine not reaching a given destination became Arthur, not Spencer. At the end of this story, Mr. Little Bears offered the second question, in (6):

(6) *The poor engines*, their memory is not so good too! but I am not sure about one thing: Have *they* gone to the Power Puffs Hotel?"

So, participants could have changed their initial answer (from instance, from "yes" to "no"). This because the group of engines that completed the action changed, and Arthur, not Spencer made the maximal interpretation false. So, the context licensed a change from a possible default (maximal) interpretation to an alternative (reference) one.

The third story presented a different set of events, but the same result. Arthur did not reach the same destination as the other engines. Mr. Little Bears then offered the third question, in (7):

(7) "Things have become pretty hectic for *the engines*! But I am not sure about one thing: Have *they* gone to the engines' house?"

If a change of interpretation is determined by change of salient group, then no change in interpretation should have occurred, since the "offending" engine was still Arthur.

Participants were invited to write down their answer, once each question was presented. After the experiment, they were asked the follow-up questions, on an individual basis. The specific predictions of the three approaches for these stories are as follows.

The Maximal approach predicts that participants interpreted *they* as always denoting the maximal referent, the maximal referent (that is, $\{t, d, d10, s, a\}$[7]). So, participants should have answered "no" in each story. They should have defended this choice because one engine, first Spencer then Arthur, always failed to reach the target destination.

The Reference approach predicts that participants should have interpreted *they* as always denoting the reference referent. This referent changed from the first to the second story (i.e. from $\{t, d, d10, a\}$ to $\{t, d, d10, s\}$), but in each story "some" or perhaps "most" engines reached their goal. So, participants should have always answered "yes", and defended this choice, because of this reason.

The Flexible approach predicts that participants should have interpreted *they* in a flexible way. In the first story, the default interpretation of *they* is the maximal one. So, first question invited a "no" answer. In the second and third story, the context licensed and strongly favoured the alternative, reference interpretation. So, participants should have answered first "no", then "yes" twice, pointing out that the second and third story were about a salient group of engines.

2.4 Results and Discussion

The results were the following:

- First Story: yes=0, no=25, 0%/100%;
- Second Story: yes=23, no=2, 92%/8%;
- Third Story: yes=24, no=1, 96%/4%;

These data suggest that the Flexible approach makes the most accurate predictions on the interpretation of *they*. Again, recall that participants could choose either a "yes" or a "no" answer, after each story. The Maximal and Reference approach do not predict the change from a "no" to a "yes" answer between first and second story. Both approaches predict either all "no" (Maximal approach) or all "yes" answers (Reference approach), so these results are not entirely predicted by these two approaches. The Flexible approach predicts a "no" answer in the first story, and a "yes" answer in the second and third story. So, this approach correctly predicts the data. The follow-up answers offer a more fine-grained perspective.

In the follow-up question time, almost all participants defended their choice by arguing that, when they answered "no" after the first story, they did so because one tank engine made the underlying declarative sentence false (i.e. Arthur). For the second and the third story, the follow-up questions revealed some interesting results. Most participants changed interpretation because they observed that in each story "four", or most (but not all) of the engines made the story true (22/25 participants). One participant noted that for a given trio, the story was always true, although he could not recall their exact identity. The only participant that answered "no" in the third story changed his interpretation twice (i.e. he answered "no-yes-no"), and admitted that he was confused by the stories. Two participants answered from "no" to "yes" in the third story, because they did not notice that the "offending" engine changed beforehand, from first to second story.

Overall, these answers to the follow-up questions, combined with the yes-no answers, offer support in favor of the Flexible approach. They also suggest that the Maximal and the Reference approach may require revision. Since these approaches do not predict that the interpretation of *they* may change in the opportune context, they cannot explain the whole range of findings in our experiment. With these facts in mind, we shall move to the conclusions.

3 Conclusions

This paper offered experimental evidence on the interpretation of the plural pronoun *they* in discourse. Three approaches to its interpretation were discussed and tested. The Maximal approach claims that plural pronouns denote all the referents denoted by their antecedent, in the context of discourse. The Reference approach claims that plural pronouns al-

[7] We represent plural referents in a set-theoretic format, with t for "Thomas", d for "Duncan", $d10$ for "Diesel 10", s for "Spencer", a for "Arthur".

ways denote the reference plural referent denoted by the combination of anaphoric antecedent and clausemate VP. The Flexible approach claims that plural pronouns receive a default interpretation (for instance, the maximal one), but also that the alternative interpretation may be accessed, if licensed (for instance, the reference one).

Two questions were addressed: what is the default interpretation of this *they* in discourse, and whether other interpretations are accessible, once the opportune context licenses them. In order to test these two hypotheses, we devised a variant of the TVJ Task that tested both hypotheses in their order of "accessibility", via the presentation of a sequence of stories. The findings invite the following conclusions.

The findings of the first story suggest that participants interpreted *they* as denoting the maximal referent, as per predictions of the Maximal and Flexible approach. Participants interpreted *they* as denoting the plural referent made of the five tank engines involved in the story (Thomas, Duncan, Diesel 10, Arthur, Spencer), and found that Spencer's actions made the underlying declarative sentence false. Hence, they invariably offered "no" as answer, as they also argued in the follow-up question.

The findings of the second and third story, on the other hand, suggest that participants would change their interpretation of *they*, as denoting a reference referent, in the opportune context. This is in line with the predictions of the Flexible approach. Almost all participants changed their answer from "no" to "yes", from first to second story, since the story made it clear that not all tank engines were salient, only a certain group, which however varied across participants.

Overall, *they* and perhaps plural anaphora in general appear to have an alternative interpretation, because their interpretation may be changed, if the context licenses this change. However, as the data also seem to suggest, this second interpretation is dependent on discourse context. For instance, if *they* has a strong quantifier as its antecedent (e.g. *the boys*), it will be interpreted as denoting a maximal referent (first story). It can be re-interpreted as denoting a reference referent, however, if the context licenses this inference (second, third story). These facts suggest that the Flexible set of approaches is on the right track, while the Maximal and the Reference sets of approaches may need further revisions.

These data also invite the following answer to our general question: what is an accurate logical and psychological model of anaphora resolution. If a model of anaphora resolution must account how speakers access anaphoric relations and resolve them in discourse, then such a model must include two complementary principles. One principle tracks the interpretation of a pronoun's antecedent NP, and assigns it to the pronoun. So, a pronoun receives a maximal or reference interpretation, depending on the formal properties of its antecedent. A second principle tracks whether this interpretation is consistent with rest of the explicit context, the sentence that the antecedent is part of. So, this principle may license the change of interpretation to the "other" type, in the opportune context.

So, a theory of anaphora resolution that correctly describes and predicts the data at hand must be flexible enough, that it allows the re-interpretation of plural pronouns in discourse. This flexibility depends on the ability for the theory to correctly establish which is the default interpretation of the antecedent NP of a pronoun, and which is the alternative interpretation. Further empirical evidence may also elucidate whether these findings can be generalized to other quantifiers (e.g. *some boys*) and anaphora. For the time being, we shall leave such inquiries for future research.

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- Francis Bond (Nanyang Technological University, Singapore)
- Wray Buntine (NICTA Canberra Research Lab and ANU)
- Lawrence Cavedon (NICTA Victoria Research Lab and University of Melbourne)
- Eric Choi (NICTA)
- Jean-Yves Delort (Google, Zurich)
- Mark Dras (Macquarie University)
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- Wayne Wobcke (University of New South Wales)
- Simon Zwarts (Google, Sydney)

Preface

This volume contains the papers accepted for presentation at the Australasian Language Technology Workshop (ALTA) 2011, held at the Australian National University (ANU), Canberra, Australia on December 1-2, 2011. This is the ninth annual instalment of the ALTA workshop in its most-recent incarnation, and the continuation of an annual workshop series that has existed in various forms Down Under since the early 1990s.

The goals of the workshop are:

- to bring together the growing Language Technology (LT) community in Australia and New Zealand and encourage interactions;
- to encourage collaboration within the community and with the wider international LT community;
- to foster interaction between academic and industrial researchers, to encourage dissemination of research results;
- to provide a forum for the discussion of new and ongoing research and projects;
- to provide an opportunity for the broader artificial intelligence community to become aware of local LT research;
- and finally, to increase visibility of LT research in Australia, New Zealand and overseas.

This year's ALTA Workshop includes 18 peer-reviewed papers, of which 12 have been presented orally, and 6 have been presented as posters. We received a total of 29 submissions. Each paper in the 'peer-reviewed papers' and the 'peer-reviewed posters' section was independently peer-reviewed by at least two members of an international program committee, in accordance with the DEST requirements for E1 conference publications. The review process was double-blind: Great care was exercised to avoid all conflicts of interest whenever an author also served as program committee/co-chair or the reviewer worked at the same institution as an author. Such conflicts of interest were resolved by transferring the reviewing task to other members of the program committee.

The proceedings also include the abstracts of the keynote presentation by Wray Buntine (National ICT Australia Ltd – NICTA) and of the special presentation by Dominique Estival (MARCS Auditory Laboratories) about the Australian Computational Linguistics Olympiad (OzCLO). There is also description of the second ALTA shared task by Diego Mollá and Abeed Sarker (Macquarie University).

We would like to thank all the authors who submitted papers to ALTA, the members of the program committee for the time and effort they put into the review process, the local organisers for their commitment and work organising this conference, and our invited speaker: Wray Buntine.

Finally, we would like to thank our sponsors, NICTA, ANU and Appen Butler Hill for supporting the workshop.

Diego Mollá and David Martinez
Program Co-Chairs

ALTA 2011 Program

Thursday, 1st December 2011

9:00-10:00	Keynote: *Discovery in Text: Visualisation, Topics and Statistics* by Wray Buntine (NICTA, Canberra)
10:00-10:30	Coffee break
10:30-10:40	ALTA Opening remarks
Session 1 - 10:40 - 12:20	
	Paper Presentations
10:40-11:05	Benjamin Börschinger and Mark Johnson *A Particle Filter algorithm for Bayesian Wordsegmentation*
11:05-11:30	Bevan Jones, Mark Johnson and Sharon Goldwater *Formalizing Semantic Parsing with Tree Transducers*
11:30-11:55	Mark Johnson *Parsing in Parallel on Multiple Cores and GPUs*
11:55-12:20	Mehdi Parviz, Mark Johnson, Blake Johnson and Jon Brock *Using Language Models and Latent Semantic Analysis to Characterise the N400m Neural Response*
12:45-14:00	Lunch break
Session 2 - 14:00 - 15:15	
	Paper Presentations
14:00-14:25	Shunichi Ishihara *A Forensic Authorship Classification in SMS Messages: A Likelihood Ratio Based Approach Using N-gram*
14:25-14:50	Su Nam Kim and Lawrence Cavedon *Classifying Domain-Specific Terms Using a Dictionary*
14:50-15:15	Stephen Merity and James R. Curran *Frontier Pruning for Shift-Reduce CCG Parsing*
15:15-15:45	Coffee break
Session 3 - 15:45 - 16:15	
	Poster presentations (5 mins per poster) John Cocks and Te Taka Keegan *A word-based approach for diacritic restoration in Māori* Nobuagi Akagi and Francesco-Alessio Ursini *The Interpretation of Complement Anaphorae: the case of The Others* Francesco-Alessio Ursini and Nobuagi Akagi *The Interpretation of Plural Pronouns in Discourse: The Case of They* Jenny Mcdonald, Alistair Knott, Richard Zeng and Ayelet Cohen *Learning from student responses: A domain-independent natural language tutor* Md. Waliur Rahman Miah, John Yearwood and Sid Kulkarni *Detection of child exploiting chats from a mixed chat dataset as a text classification task* Marcin Nowina-Krowicki, Andrew Zschorn, Michael Pilling and Steven Wark *ENGAGE: Automated Gestures for Animated Characters*
16:15-17:25	**Presenters put up their posters**
17:25-18:45	**Poster session with ALS (drinks and nibbles provided)**
19:30	**Dinner with ADCS**

Friday, 2nd December 2011

Session 4 - 9:00 - 10:40

Joint Session with ADCS

Li Wang, Diana Mccarthy and Timothy Baldwin
Predicting Thread Linking Structure by Lexical Chaining

Diego Mollá and Maria Elena Santiago-Martinez
Development of a Corpus for Evidence Based Medicine Summarisation

Mike Symonds, Peter Bruza, Laurianne Sitbon and Ian Turner
Tensor Query Expansion: A cognitively motivated relevance model

Yan Shen, Yuefeng Li, Yue Xu, Renato Lannella, Abdulmohsen Algarni and Xiaohui Tao
An Ontology-based Mining Approach for User Search Intent Discovery

10:40-11:10 Coffee break

Session 5 - 11:10-12:25

Paper Presentations

11:10-11:35 **(best paper award)** François Lareau, Mark Dras, Benjamin Börschinger and Robert Dale
Collocations in multilingual text generation: Lexical Functions meet Lexical Functional Grammar

11:35-12:00 Abeed Sarker, Diego Mollá and Cécile Paris
Outcome Polarity Identification of Medical Papers

12:00-12:25 Sze-Meng Jojo Wong, Mark Dras and Mark Johnson
Topic Modeling for Native Language Identification

12:25-14:00 Lunch break

14:00-15:00 **Prizes and ALTA AGM Meeting**

Special presentation - 15:00-15:30

Dominique Estival
OzCLO: The Australian Computational Linguistic Olympiad

15:30-16:00 Coffee break

Special presentation - 16:00-16:45

Diego Mollá and Abeed Sarker
Automatic Grading of Evidence: The 2011 ALTA Shared Task

16:45-17:00 **Wrap-up**

17:25-18:45 **Poster session with ALS (drinks and nibbles provided)**

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