Dynamic Social Choice and Pronouns

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Abstract

Dynamic social choice has been discussed from the perspective of dynamic change of preferences over time. Parkes and Procaccia (2013) discuss Markov decision processes while Freeman et al. (2017) present algorithm for fair allocation. Nishiguchi (2011, 2012a,b, 2016a,b, 2017b,a) have analyzed changing references of pronouns such as she, he, and they in texts in the setting of dynamic social choice. This paper presents refurbished view on pronoun resolution in dynamic setting.

1 Dynamic Social Choice for Pronoun Resolution

While the Centering Theory (Grosz and Sidner 1986, Grosz et al. n.d.) analyzes pronoun resolution in contraint-based decision theory, social choice theory has not been used in analyzing linguistic issues. Below I present a dynamic system for anaphora resolution building on Parkes and Procaccia (2013) and Freeman et al. (2017). The presented model is a modified version of Nishiguchi (2011, 2012a,b, 2016a,b, 2017b,a) which proposed anaphora resolution as social choice. In this view, contextual interpretation of pronouns such as she, he, they, and it is a social welfare function (SWF). The possible coreferential antecedent noun phrases such as John, Mary, Tokyo, the station, books are ranked with preferences.

(1) a. M=(S, A, P, T)
S: pronouns, A: antecedents, P: contextual interpretation, T: time
b. S= \{he_1, ..., he_m, she_1, ..., she_n, it_1, ..., it_o, they_1, ..., they_p\}
c. contextual interpretation P (SWF): S×T → A

The decision processes are not completely Markovian because pronoun reference incorporates discourse coherence. The salient entity in discourse tends to stay
referents for a couple of sentences. For example, Sarah may stay referent of she in a few sentences but can be switched to someone else.

Consider a set of \( n \) pronouns \( A = \{a_1, a_2, \ldots, a_n\} \) and a set of \( m \) possible antecedents \( \chi = \{k_1, k_2, \ldots, k_m\} \). Let the dispersed and ordered time be \( T = (t_1, t_2, \ldots, t_n) \). Every pronoun \( a \) sets its valuation \( v^t_a(k_j) \in N \) for every alternative \( k_j \). Thus the input at time \( t \) is a matrix \( V^t = (v^t_a(k))_{a,j} \). Let \( v^t(k_j) \) denote the \( j \)-th column of matrix \( V^t \), the vector of valuations for alternative \( k_j \). For time \( t \), a Dynamic Social Choice Function (DSCF) picks a set of alternatives \( C_t \), from which a single alternative \( c_t \) is chosen arbitrary.

\[
(2) \quad u_t(k) = \sum_{t'=1}^{t} v^t_k(c_{t'})
\]

2 Example

In the following text taken from corpus, referents of pronouns such as she or he changes overtime. For example, the referent of the third person masculine pronoun he refers to Aileen’s husband in \( \sigma_1 \) but him in \( \sigma_2 \) is coreferential with Duke.

(3) \( \sigma_1 \) There were ooh’s and aah’s when he\(_1\) finished, and some unbridled laughter. Aileen\(_a\) was looking dubiously at her\(_1\) husband\(_b\) but he\(_2\) was in no mood to disapprove.

\( \sigma_2 \) He\(_x3\) winked at the Duke\(_d\) and called across to him\(_x4\), ‘What a grand thing, your Honour, to have a wedding without a minister!’ The Duke\(_d\) did his\(_x5\) stately bow at that and then Donald\(_m\) was calling for another song.

\( \sigma_3 \) Some of the veterans\(_v\) were on the point of giving tongue but young Donald McCulloch\(_m\) was on his\(_x6\) feet and moving into the middle of the ring, he\(_x7\) was full of himself\(_x8\), sparkling with mischief but with an undertow of ardour.

\( \sigma_4 \) ‘Duncan Ban MacIntyre\(_b\) wrote a song for his\(_x9\) wife Mary\(_r\).

\( \sigma_5 \) I do not know if Alex\(_t\) used it to court his\(_10\) Mary\(_r\) – he\(_x11\) must have used something –’ The joke was unconscious but crowing laughter came from the young men\(_n\) beside the whisky jar. (BNC A0N1311-1315, King Cameron)

Therefore, disambiguation function changes between passages and dynamic resolution is called for.
References


**URL:** ceur-ws.org
