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AN APPLICATION FOR SCHEMATA

Understanding material presented in natural language has been a preoccupation of people working in artificial intelligence for many years. One of the techniques used in this field relies on certain knowledge structures called *schemata*, which purport to represent a collection of expectations and understandings about some topic or sequence of events. In application, a schema is compared with the text to be understood, and correspondences between items in the text and appropriate items in the schema sought. If a correspondence can be established at a sufficient number of points, we have confidence that the schema "fits" the text, and it becomes possible to use the information provided in the schema to fill out the information in the text, and perhaps to link together references in the text which would otherwise appear to be unconnected.

In effect, the schema provides a context within which the text can be interpreted. Schemata were used in psychological work long before artificial intelligence came along – indeed, long before effective computers were available. This excerpt describes an early example[2] :

> The first case is that of schema theory, which originated within psychology in the work of the British psychologist, Sir Fredrick Bartlett, although the roots go back at least as far as Kant (1787). In the 1930s, Bartlett examined the ways in which people distort and reconstruct the memory of some event or story which they have previously heard or read. In one of his most famous studies (Bartlett, 1932) he used a story based on a North American Indian legend 'War of the Ghosts'. He gave this story to people to read and then tested their recall of it after various intervals of time. Bartlett was concerned with the systematic memory errors which non-Indians made in recalling the story (he had deliberately chosen a story which did not fit with the cultural conceptions of the people in his experiment). His subjects 'forgot' aspects of the legend which were incompatible with their knowledge. To account for his findings, Bartlett proposed that when people read a story they construct an abstract representation, or schema, of the story's general theme. This representation, he proposed, is affected by the reader's personal system of beliefs and emotions.

It is worth remarking that the object of this work is not to find the *meaning* of the story in any absolute sense; rather, it is to investigate what people believe about the story, and how this is affected by their cultural backgrounds.

TE TIRITI O WAITANGI versus THE TREATY OF WAITANGI.

It is not necessary to go into all the arguments of nearly 150 years about the meaning of the treaty. It is sufficient here to remark that there are bitter disagreements, in many cases centred on what are seen as different interpretations of the document as it is seen through Maori and European eyes, because of the very significant cultural differences in the two parties' backgrounds. Matters are not simplified by the existence of (at least) two versions of the treaty, one in Maori and one in English, which are claimed to have significantly different meanings. The issues to be resolved seem to be quite close to the questions investigated by Bartlett, as described in the excerpt reproduced above. In the terms used there, Maori and European come to the document with different schemata, and in consequence believe different things of it. It may be that an attempt to model this position through the techniques of artificial intelligence would throw some light on the reasons behind the misunderstandings.

A possible merit of an approach along these lines would be its comparative objectivity; it is an attempt to step back from the intensely emotional debate inseparable from people's deep involvement in the principles which underlie the disagreements, and to provide, if nothing more, a form of discussion in which suggestions could be made and tested, and details refined step by step in the hope of reaching a position of useful understanding.

It is emphatically not an attempt to "settle the question", nor to construct a computer model of Maori or European beliefs about anything : a proposal described in any such terms is far too ambitious to be credible.

HOW IT WOULD WORK.

Here I offer tentative suggestions only; details would of necessity be settled by the participants. Nevertheless, it is appropriate to put forward a possible scenario as an illustration of the nature of the work which would have to be included.

The goal is to explore the different interpretations of the treaty, and to investigate possible causes for disagreement. We therefore need different interpretations; and I would expect work to proceed in parallel on four combinations :

EE :	English treaty, with European schema;
EM :	English treaty, with Maori schema;
MM :	Maori tiriti, with Maori schema;
ME :	Maori tiriti, with European schema.

Unless there are good reasons for some other method, I would suggest a stepwise approach : begin with the first clause of the treaty, and build the schemata required to interpret this, using the EE and MM combinations. Next, try the EM and ME combinations. I am not sure whether it would be better to try to sort out any conflicts by amending the schemata at this point, or to note the conflicts for future consideration, and to carry on to the following clauses. Questions of language comprehension and accurate translation are involved.

There may also be questions of legal interpretation. It seems to me that the meaning of the English text as seen by a lawyer is not the same as that perceived by a lay reader, and perhaps the same is true of the Maori text. Perhaps law vs. lay is yet another dimension to be added to the possible interpretations !

WHO SHOULD BE INVOLVED.

Ideally, not too many people in the first instance. It seems to me that a sensible plan would be to begin with a few people working on a feasibility study; they would take the investigation far enough to test the ideas, without in any sense expecting to produce a definitive result. More people might well be needed once the groundwork had been completed, as a lot of skills are necessary. This is only a tentative list, and an early task for the participants would be to define more clearly just what was intended.

Adequate authorities on Maori and English languages;
People able to put the Maori and European points of view;
Computists, to do the work.

REFERENCES.

1 : M. Yazdani (ed) : *Artificial intelligence : principles and applications* (Chapman and Hall, 1986)
2 : N.E. Sharkey, G.D.A. Brown : *Why artificial intelligence needs an empirical foundation*, Chapter 11 of ref. 1.