RSA Model of Māori language learning

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The Goal

To simulate a two agent teacher student language learning scenario, following a well regarded language teaching model for low resource languages called ‘Te Ataarangi’

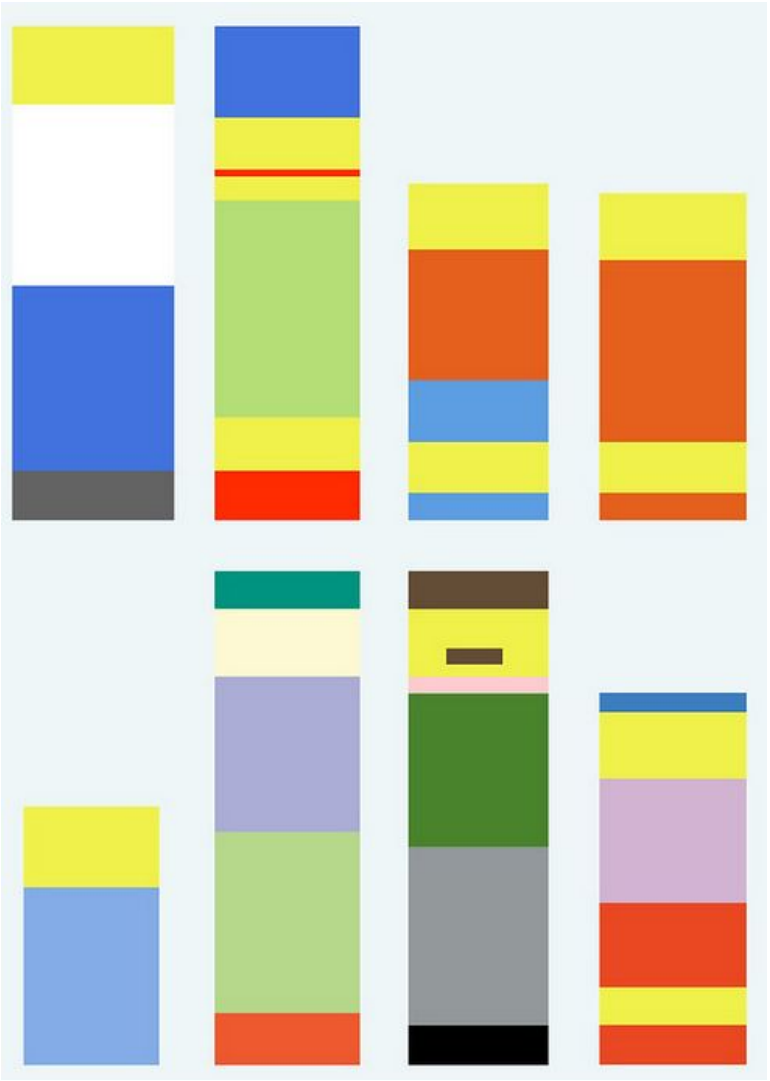
The silent way

Adapted from the ‘silent way’, a language teaching methodology created by Caleb Gattegno

The method emphasises student autonomy and encourages students to make conjectures and fix their own errors

Cuisenaire rods

The method makes use of cuisenaire rods to use as proxies for demonstrating language concepts without the need to use the students native language



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Te Ataarangi

In 1979, Dame Katerina Te Heikōkō Mataira discovered the ‘Silent Method’ in Fiji.

She returned to New Zealand and together with Ngoingoi Pēwhairangi they co-developed this method of teaching.

Today, Te Ataarangi is the dominant method for teaching Māori language in an immersion setting

RSA Method

What I realised:

The Ataarangi method is a multi-agent teacher student signalling game, with multiple rational speaker agents (at minimum, two).

In this work I attempt to simulate a te Ataarangi lesson whereby a teacher agent teaches 3 utterances to a student agent.

How it works

There are two agents, a teacher and a student. Both are implemented as rational speech actors.

The world states are sets containing different numbers of cuisenaire rods.

The teacher agent has a matrix containing the correct correspondence between the chosen utterances and the world states, while the student starts with a flat prior and learns from the teacher agent by participating in a dialogue.

What are we learning

There are 3 utterances we are attempting to teach to the student agent:

Te rākau	The rod (singular)
Ngā rākau	The rods (plural)
He rākau	Some rods (but not all)

World states

As an example, we can consider 5 world states.

The proper utterance for each of these world states is given on the right column

1 rod	Te rākau
2 rods	He rākau
3 rods	He rākau
4 rods	He rākau
5 rods	Ngā rākau

The literal listener matrix

	Te rākau (“The rod”)	Ngā rākau (“The rods”)	He rākau (“Some rods”)
1 rākau	1.0	0	0
2 rākau	0	0	0.3333
3 rākau	0	0	0.3333
4 rākau	0	0	0.3333
5 rākau	0	1.0	0

The teacher

- Is initialized with the correct literal listener matrix
- Makes inferences about the students literal listener matrix
- Can suggest a (world state, utterance) pair in order to fix errors in the students inference based on the dialogue history
- Adjusts its beliefs about the students beliefs in the course of the dialogue

The student

- Is initialized with the a uniform prior literal listener matrix
- Updates its beliefs to incorporate the examples from the teacher
- Can suggest a (world state, utterance) pair in order to demonstrate its own knowledge.
- Takes feedback from the teacher agent and updates its own beliefs

The dialogue

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Interaction 1:
Teacher: For '1 rākau', the best utterance is 'Te rākau'.
Student: For '2 rākau', I believe the correct utterance is 'Ngā rākau'.
Incorrect. The correct utterance should be 'He rākau'.
student.literal_listener_matrix:
[[0.25       0.         0.        ]
 [0.         0.         0.25      ]
 [0.25       0.33333333 0.25      ]
 [0.25       0.33333333 0.25      ]
 [0.25       0.33333333 0.25      ]]


Interaction 2:
Teacher: For '5 rākau', the best utterance is 'Ngā rākau'.
Student: For '3 rākau', I believe the correct utterance is 'Ngā rākau'.
Incorrect. The correct utterance should be 'He rākau'.
student.literal_listener_matrix:
[[0.5        0.         0.        ]
 [0.         0.         0.33333333]
 [0.         0.         0.33333333]
 [0.5        0.5        0.33333333]
 [0.         0.5        0.        ]]
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The dialogue

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Interaction 3:
Teacher: For '4 rākau', the best utterance is 'He rākau'.
Student: For '3 rākau', I believe the correct utterance is 'He rākau'.
Correct!
student.literal_listener_matrix:
[[1.         0.         0.        ]
 [0.         0.         0.33333333]
 [0.         0.         0.33333333]
 [0.         0.         0.33333333]
 [0.         1.         0.        ]]

The student's understanding is now aligned with the teacher's knowledge
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