Posits and Assertions

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**definition of a posit and its dereferencing set**

A *posit* is a triple, \[\{(i_1, r_1), \ldots, (i_n, r_n)\}, v, t\], where the first element is a set of ordered pairs, the second a data value, and the third a time point. The set is called a *dereferencing set*, where each member is an ordered pair of a unique identifier and a string.

**definition of an assertion**

*Concurrent–reliance–temporal:*

An *assertion* is a predicate, \(\text{assert}(P, p, \alpha, T)\), taking four arguments, where the first argument is a unique identifier, the second a posit, the third a real number in the range \([-1, 1]\), and the fourth a time point.

*Uni–temporal:*

An *assertion* is a predicate, \(\text{assert}(p)\), taking a posit as its argument.
It’s Monday. Archie invites you to meet him and Bella for lunch on Friday.
It’s *Monday*. Archie invites you to meet him and Bella for lunch on Friday.
It’s Monday. *Archie* invites you to meet him and Bella for lunch on Friday.
It’s Monday. Archie invites you to meet him and Bella for lunch on Friday.
It’s Monday. Archie invites you to meet him and Bella for lunch on Friday.
It’s Monday. Archie invites you to meet him and Bella for lunch on Friday.
It’s Monday. Archie invites you to meet him and Bella for lunch on Friday.
It’s Monday. Archie invites you to meet him and Bella for lunch on Friday.
It’s Monday. Archie invites you to meet him and Bella for lunch on Friday.
It’s Monday. Archie invites you to meet him and Bella for lunch on Friday.
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Concurrent–reliance–temporal Anchor Modeling

Someone is at some time somewhat sure about something (or its opposite).

{Archie, {{(#42, type)}, lunch }, 1, MONDAY),
  (Archie, {{(#42, date)}, Friday }, 1, MONDAY),
  (The Database, {{(#42, attendees)}}, 2, monday], 1, MONDAY)}

{(Archie, {{(#42, meeting), (#1, participant)}}, accepted, monday], 1, MONDAY),
  (Bella, {{(#42, meeting), (#2, participant)}}, accepted, monday], 1, MONDAY),
  (You, {{(#42, meeting), (#3, participant)}}, pending, monday], 1, MONDAY)}
It’s Monday. Archie invites you to meet him and Bella for lunch on Friday.

Uni–temporal Anchor Modeling
Everyone is always completely sure about all the same things (and no opposites).

{(Archie, [{{#42, type}}, lunch, 1, MONDAY),
  (Archie, [{{#42, date}}, Friday, 1, MONDAY),
  (The Database, [{{#42, attendees}}, 2, monday], 1, MONDAY)}

{(Archie, [{{#42, meeting}, (#1, participant)}, accepted, monday], 1, MONDAY),
  (Bella, [{{#42, meeting}, (#2, participant)}, accepted, monday], 1, MONDAY),
  (You, [{{#42, meeting}, (#3, participant)}, pending, monday], 1, MONDAY)}
An assertion is called *positive* when the reliability is above zero.

(Archie, [(#42, date)], Friday, 1, MONDAY)

Archie is completely certain that the lunch is on Friday.

{(Archie, [(#42, type)], lunch], 1, MONDAY),
(Archie, [(#42, date)], Friday], 1, MONDAY),
(The Database, [(#42, attendees)], 2, monday], 1, MONDAY)}

{(Archie, [(#42, meeting), (#1, participant)], accepted, monday], 1, MONDAY),
(Bella, [(#42, meeting), (#2, participant)], accepted, monday], 1, MONDAY),
(You, [(#42, meeting), (#3, participant)], pending, monday], 1, MONDAY)}
An assertion is called *negative* when the reliability is below zero.

(Archie, [{(#42, date)}, Friday], -1, MONDAY)

Archie is completely certain that the lunch is *not* on Friday.

{(Archie, [{(#42, type)}, lunch], 1, MONDAY),
 (Archie, [{(#42, date)}, Friday], 1, MONDAY),
 (The Database, [{(#42, attendees)}], 2, monday], 1, MONDAY})

{(Archie, [{(#42, meeting), (#1, participant)}, accepted, monday], 1, MONDAY),
 (Bella, [{(#42, meeting), (#2, participant)}, accepted, monday], 1, MONDAY),
 (You, [{(#42, meeting), (#3, participant)}, pending, monday], 1, MONDAY)}
An assertion is called *completely uncertain* when the reliability is zero.

(Archie, [{(#42, date)}, Friday], 0, MONDAY)

Archie has absolutely no idea when the lunch is supposed to be held.

{(Archie, [{(#42, type)}, lunch], 1, MONDAY),
 (Archie, [{(#42, date)}, Friday], 1, MONDAY),
 (The Database, [{(#42, attendees)}, 2, monday], 1, MONDAY)}

{(Archie, [{(#42, meeting), (#1, participant)}, accepted, monday], 1, MONDAY),
 (Bella, [{(#42, meeting), (#2, participant)}, accepted, monday], 1,MONDAY),
 (You, [{(#42, meeting), (#3, participant)}, pending, monday], 1, MONDAY)}
Assertions without complements are in *canonical form*.

\[(\text{Archie}, \{(#42, date)\}, \text{not Friday}, 1, \text{MONDAY})\]
\[(\text{Archie}, \{(#42, date)\}, \text{Friday}, -1, \text{MONDAY})\]

We assume canonical form hereafter.

This symmetry shows how to translate assertions with complements to canonical form.

\[
\begin{align*}
\{(\text{Archie}, \{(#42, type)\}, \text{lunch }, 1, \text{MONDAY}), \\
(\text{Archie}, \{(#42, date)\}, \text{Friday }, 1, \text{MONDAY}), \\
(\text{The Database}, \{(#42, attendees)\}, 2, \text{monday}], 1, \text{MONDAY})\}
\end{align*}
\]

\[
\begin{align*}
\{(\text{Archie}, \{(#42, meeting), (#1, participant)\}, \text{accepted, monday}], 1, \text{MONDAY}), \\
(\text{Bella}, \{(#42, meeting), (#2, participant)\}, \text{accepted, monday}], 1, \text{MONDAY}), \\
(\text{You}, \{(#42, meeting), (#3, participant)\}, \text{pending, monday}], 1, \text{MONDAY})\}
\end{align*}
\]
A reassertion asserts a posit and its reliability again at a later positing time.

(You, [{(#42, meeting), (#3, participant)}, pending, monday], 1, TUESDAY)

On Tuesday you state that you are still pending since Monday.

{(Archie, [{(#42, type)}, lunch], 1, MONDAY),
(Archie, [{(#42, date)}, Friday], 1, MONDAY),
(The Database, [{(#42, attendees)}, 2, monday], 1, MONDAY)}

{(Archie, [{(#42, meeting), (#1, participant)}, accepted, monday], 1, MONDAY),
(Bella, [{(#42, meeting), (#2, participant)}, accepted, monday], 1, MONDAY),
(You, [{(#42, meeting), (#3, participant)}, pending, monday], 1, MONDAY)}
A revaluation asserts a posit to a different reliability at a later positing time.
(Bella, [{{(#42, meeting)}, (#2, participant)}, accepted, monday], 0.5, TUESDAY)

On Tuesday Bella states that what she said on Monday was that she only might attend on Friday.

{(Archie, [{{(#42, type)}, lunch}, 1, MONDAY),
  (Archie, [{{(#42, date)}, Friday}, 1, MONDAY),
  (The Database, [{{(#42, attendees)}, 2, monday}, 1, MONDAY})

{(Archie, [{{(#42, meeting), (#1, participant)}, accepted, monday}, 1, MONDAY),
  (Bella, [{{(#42, meeting), (#2, participant)}, accepted, monday}, 1, MONDAY),
  (You, [{{(#42, meeting), (#3, participant)}, pending, monday}, 1, MONDAY])

{(Bella, [{{(#42, meeting), (#2, participant)}, accepted, monday}]}
A restatement is when the preceding value over changing time is the same.

(The Database, [{(#42, attendees), 2, tuesday}, 1, WEDNESDAY)

On Wednesday the Database states that there still were two attendees on Tuesday.

{(Archie, [{(#42, type)}, lunch], 1, MONDAY),
(Archie, [{(#42, date)}, Friday], 1, MONDAY),
(The Database, [{(#42, attendees)}, 2, monday], 1, MONDAY)}

{(Archie, [{(#42, meeting), (#1, participant)}, accepted, monday], 1, MONDAY),
(Bella, [{(#42, meeting), (#2, participant)}, accepted, monday], 1, MONDAY),
(You, [{(#42, meeting), (#3, participant)}, pending, monday], 1, MONDAY)}
A change is when the preceding value over changing time is different.

You, $\{(#42, meeting), (#3, participant)\}$, accepted, wednesday, 1, WEDNESDAY

You accepted the meeting on Wednesday.

(The Database, $\{(#42, attendees)\}$, 3, wednesday, 1, THURSDAY)

The Database states that the number of attendees has changed to three since Wednesday.

{(Archie, $\{(#42, type)\}$, lunch], 1, MONDAY),
(Archie, $\{(#42, date)\}$, Friday }, 1, MONDAY),
(The Database, $\{(#42, attendees)\}$, 2, monday], 1, MONDAY)}

{(Archie, $\{(#42, meeting), (#1, participant)\}$, accepted, monday], 1, MONDAY),
(Bella, $\{(#42, meeting), (#2, participant)\}$, accepted, monday], 1, MONDAY),
(You, $\{(#42, meeting), (#3, participant)\}$, pending, monday], 1, MONDAY)}
A retraction is when a reliable posit is now considered completely unreliable.

(Archie, [{(#42, type)}, lunch], 0, THURSDAY)

On Thursday Archie cancels the lunch altogether.

{(Archie, [{(#42, type)}, lunch], 1, MONDAY),
(Archie, [{(#42, date)}, Friday], 1, MONDAY),
(The Database, [{(#42, attendees)}], 2, monday], 1, MONDAY)}

{(Archie, [{(#42, meeting), (#1, participant)}], accepted, monday], 1, MONDAY),
(Bella, [{(#42, meeting), (#2, participant)}], accepted, monday], 1, MONDAY),
(You, [{(#42, meeting), (#3, participant)}], pending, monday], 1, MONDAY)}
A *correction* is a retraction of the erroneous posit and a simultaneous assertion.

On Thursday Archie realises that he intended to meet for dinner instead of lunch.

\[
\begin{align*}
&\text{(Archie, \{(#42, \text{type}), \text{lunch}\}, 0, \text{THURSDAY})} \\
&\text{(Archie, \{(#42, \text{type}), \text{dinner}\}, 1, \text{THURSDAY})}
\end{align*}
\]

These contain two different posits
With *decisiveness* only one value for each identity, role, and time may be asserted.

This excludes complete uncertainty, for which a positor may be oblivious to arbitrarily many posits.

{(Archie, [{{#42, type}}, lunch ], 1, MONDAY),
 (Archie, [{{#42, date}}, Friday ], 1, MONDAY),
 (The Database, [{{#42, attendees}}, 2, Monday], 1, MONDAY)}

{(Archie, [{{#42, meeting}, (#1, participant)}], accepted, Monday], 1, MONDAY),
 (Bella, [{{#42, meeting}, (#2, participant)}], accepted, Monday], 1, MONDAY),
 (You, [{{#42, meeting}, (#3, participant)}], pending, Monday], 1, MONDAY)}
With *indecisiveness* many values for each identity, role, and time may be asserted.

\[
\{(Archie, \{(\#42, \text{type})\}, \text{breakfast}], 0.2, \text{THURSDAY}),
(Archie, \{(\#42, \text{type})\}, \text{lunch}], 0.3, \text{THURSDAY}),
(Archie, \{(\#42, \text{type})\}, \text{dinner}], 0.5, \text{THURSDAY})\}
\]

As long as the reliabilities obey:

\[
\frac{1}{2} \sum_{i=1}^{n} \left[ 1 - \alpha_i |\alpha_i|^{-1} \right] + \sum_{i=1}^{n} \alpha_i \leq 1
\]

the axiom of non-contradiction.

\[
0.5(1-0.2/|0.2| +1-0.3/|0.3| + 1–0.5/|0.5|) + (0.2 + 0.3 + 0.5) = 1
\]

\[
\{(Archie, \{(\#42, \text{type})\}, \text{lunch], 1, \text{MONDAY}),
(Archie, \{(\#42, \text{date})\}, \text{Friday}], 1, \text{MONDAY}),
(The \ Database, \{(\#42, \text{attendees})\}, 2, \text{Monday}], 1, \text{MONDAY})\}
\]

\[
\{(Archie, \{(\#42, \text{meeting}), (#1, \text{participant})\}, \text{accepted, monday}], 1, \text{MONDAY}),
(Bella, \{(\#42, \text{meeting}), (#2, \text{participant})\}, \text{accepted, monday}], 1, \text{MONDAY}),
(You, \{(\#42, \text{meeting}), (#3, \text{participant})\}, \text{pending, monday}], 1, \text{MONDAY})\}
\]
definition of an anchor

Concurrent–reliance–temporal:
An anchor is a predicate, anchor \((P, a, c, \alpha, T)\), taking five arguments, where the first argument is a unique identifier, the second an assertion, the third a string, and the fourth a real number in the range \([-1, 1]\), and the fourth a time point.

Uni–temporal:
An anchor is a predicate, anchor \((a, c)\), taking two arguments, where the first argument is an assertion and the second a string.
It’s Monday. Archie invites you to meet him and Bella for lunch on Friday.

(One Modeler, \(a_1\), \textit{Appointment}, 1, MONDAY)
(One Modeler, \(a_2\), \textit{Appointment}, 1, MONDAY)
(One Modeler, \(a_3\), \textit{Appointment}, 1, MONDAY)
(Another Modeler, \(a_1\), \textit{Invitation}, 0.5, MONDAY)
(Another Modeler, \(a_2\), \textit{Invitation}, 0.5, MONDAY)
(Another Modeler, \(a_3\), \textit{Response}, 0.5, MONDAY)

Anchors provide a \textit{classification} of posits and a set of anchors become a \textit{model}.

\[
\text{ANCHOR}(P,a,c,\alpha,T)
\]

\[
\text{ASSERT}(P,p,\alpha,T)
\]

\[
\text{POSIT} p = \{ (i_1,r_1), \ldots, (i_n,r_n) \}, v, t ?
\]

\[
a_1 = \text{(Archie, \{\{#42, \text{type}\}\}, \text{lunch }}, 1, \text{MONDAY})
\]
\[
a_2 = \text{(Archie, \{\{#42, \text{date}\}\}, \text{Friday }}, 1, \text{MONDAY})
\]
\[
a_3 = \text{(The Database, \{\{#42, \text{attendees}\}\}, 2, \text{monday}]}}, 1, \text{MONDAY})
\]
It’s Monday. Archie invites you to meet him and Bella for lunch on Friday.

In uni-temporal Anchor modeling the theory becomes much simpler, with one implicit modeler and one certain model.

$$\text{POSIT } p = \left\{ \left( i_1, r_1 \right), \ldots, \left( i_n, r_n \right) \right\}, v, t?$$

$$\text{ANCHOR } (a, c)$$

$$\text{ASSERT } (p)$$

$$a_1 = (\text{Archie}, \left\{ \left( \#42, \text{type} \right) \right\}, \text{lunch}, 1, \text{MONDAY})$$

$$a_2 = (\text{Archie}, \left\{ \left( \#42, \text{date} \right) \right\}, \text{Friday}, 1, \text{MONDAY})$$

$$a_3 = (\text{The Database}, \left\{ \left( \#42, \text{attendees} \right) \right\}, 2, \text{MONDAY})$$