0.0.1 Update

The operation *update* will return a Collection *coll*! which is the same as the input Collection *coll*? except for at index *idx*?. The existing member $coll?_{idx?}$ is replaced by the provided Value *v*? at *idx*? in *coll*! such that

$$idx? \mapsto v? \in coll! \land idx? \mapsto coll?_{idx?} \notin coll!$$

which is equivalent to $remove \gg append$

$$update(coll?, v?, idx?) \equiv append(remove(coll?, idx?), v?, idx?)$$

The functionality of *update* is further explained in the following schema.

$Update[Collection, V, \mathbb{N}]$

$$\begin{array}{l} idx? : \mathbb{N} \\ coll?, coll! : Collection \\ v? : V \\ update\_ : Collection \times V \times \mathbb{N} \rightarrowtail Collection \\ \hline 1 = \# idx? \\ coll! = update(coll?, v?, idx?) \bullet \\ \quad let\ coll' == \{ i : \mathbb{N} \mid i \in 0 .. idx? \} \upharpoonright coll? \\ \quad\quad coll'' == head(coll') \frown v? \\ \quad\quad coll''' == \{ j : \mathbb{N} \mid j \in idx? + 1 .. \# coll? \} \upharpoonright coll? \\ \quad = coll'' \frown coll'' \Rightarrow \\ \quad\quad (append(remove(coll', idx?), v?, idx?) \frown coll'') \land \\ \quad\quad (v? \mapsto idx? \in coll!) \land \\ \quad\quad (\# coll! = \# coll?) \land \end{array}$$

The value which previously existed at $idx? \in coll?$ is replaced with *v*? to result in *coll*!

- $coll'$ is the items in *coll*? up to and including *idx*?
- $coll''$ is the items in *coll*? except the item at *idx*? has been replaced with *v*?
- $coll'''$ is the items in *coll*? from $idx? + 1$ to $\# coll? \Rightarrow coll?_{idx?} \notin coll''$

The following example illustrates these properties.

$$\begin{array}{l} X = \langle x_0, x_1, x_2 \rangle \\ \quad x_0 = 0 \\ \quad x_1 = foo \\ \quad x_2 = \langle a, b, c \rangle \\ \quad v? = bar \end{array}$$

$$update(X, v?, 0) = \langle bar, foo, \langle a, b, c\rangle\rangle$$
$$update(X, v?, 1) = \langle 0, bar, \langle a, b, c\rangle\rangle$$
$$update(X, v?, 2) = \langle 0, foo, bar\rangle$$
$$update(X, v?, 3) = \langle 0, foo, \langle a, b, c\rangle, bar\rangle$$
$$update(X, v?, 4) = append(X, v?, 3) = update(X, v?, 3) \iff 3 \notin \operatorname{dom} X$$