Service: EditMap **refine** Map

Types: bool, int, Cell

Observators:
isReachable: $[EditMap] \times int \times int \times int \times int \rightarrow bool$ **pre** isReachable(M,x1,y1,x2,y2) **requires** CellNature(M,x1,y1) $\neq$ WLL **and** CellNature(M,x2,y2) $\neq$ WLL
isReady: [EditMap] $\rightarrow$ bool

Constructors: $\emptyset$

Operators:
SetNature: $[EditMap] \times int \times int \times Cell \rightarrow [EditMap]$ **pre** SetNature(M,x,y)
requires 0$\leq$x$<$Width(M) **and** 0$\leq$y$<$ Height(M)

Observations:
[**Invariants**]:
isReachable(M,x1,y1,x2,y2) = **exists** P **in** Array[int,int], P[0] = (x1,y1)
and P[size(P)-1] = (x2,y2)
and forall i **in** [1;size(P)-1], (P[i-1]=(u,v) **and** P[i]=(s,t)) **implies** (u-s)^2 + (v-t)^2 = 1
and forall i **in** [1;size(P)-2], P[i-1]=(u,v) **implies** CellNature(M,u,v) $\neq$ WLL
isReady(M) = **exists** xi,yi,xo,yo **in** int^4 , CellNature(M,xi,yi) = IN
and CellNature(M,xi,yi) = OUT
and isReachable(M,xi,yi,xo,yo)
and forall x,y in int 2 , x $\neq$ xi or y $\neq$ yi **implies** CellNature(M,x,y) $\neq$ IN
and forall x,y in int 2 , x $\neq$ xo or y $\neq$ yo **implies** CellNature(M,x,y) $\neq$ OUT
forall x,y in int, CellNature(M,x,y) $\in \{DNO, DNC\}$ **implies** CellNature(M,x+1,y) = CellNature(M,x-1,y) = EMP **and** CellNature(M,x,y-1) = CellNature(M,x,y+1) = WLL
forall x,y in int, CellNature(M,x,y) $\in \{DWO, DWC\}$ **implies** CellNature(M,x+1,y) = CellNature(M,x-1,y) = WLL **and** CellNature(M,x,y-1) = CellNature(M,x,y+1) = EMP

[SetNature]:
CellNature(SetNature(M,x,y,Na),x,y) = Na **forall** u,v in int^2 , u $\neq$ x or
v $\neq$ y **implies** CellNature(SetNature(M,x,y),u,v) = CellNature(M,u,v)