Service: Mob

Types: bool, int, Cell

Observators:
Env: [Mob] $\rightarrow$ Environment Col: [Mob] $\rightarrow$ **int** Row: [Mob] $\rightarrow$ **int** Face: [Mob] $\rightarrow$ Dir

Constructors:
init: Environment $\times$ **int** $\times$ **int** $\times$ Dir $\rightarrow$ [Mob] **pre in**it(E,x,y,D) **requires** $0 \leq$ x $<$ Environment::Width(E) **and** $0 \leq$ y $<$ Environment::Height(E)

Operators:
Forward: [Mob] $\rightarrow$ [Mob]
Backward: [Mob] $\rightarrow$ [Mob]
TurnL: [Mob] $\rightarrow$ [Mob]
TurnR: [Mob] $\rightarrow$ [Mob]
StrafeL: [Mob] $\rightarrow$ [Mob]
StrafeR: [Mob] $\rightarrow$ [Mob]
Attack: [Mob] $\rightarrow$ [Mob]
[invariant] :
$0 \leq$ Col(M) $<$ Environment::Width(Envi(M)) $0 \leq$ Row(M) $<$ Environment::Height(Envi(M)) Environment::CellNature(Envi(M),Col(M),Row(M)) $\notin \{WLL, DNC, DWC\}$

[init] :
Col(init(E,x,y,D)) = x Row(init(E,x,y,D)) = y Face(init(E,x,y,D)) = D Envi(init(E,x,y,D)) = E

[Forward]:
Face(M)=S **implies** Environment::CellNature(Envi(M),Col(M),Row(M)+1) $\in \{EMP, DWO\}$
and Row(M)+1 $<$ Environment::Width(Envi(M))
and Environment::CellContent(Envi(M),Col(M),Row(M)+1) = No
implies Row(Forward(M)) = Row(M) + 1
and Col(Forward(M)) = Col(M)

Face(M)=S **implies** Environment::CellNature(Envi(M),Col(M),Row(M)+1)
$\in \{EMP, DWO\}$ or Row(M)+1 $\geq$ Environment::Width(Envi(M)) or Environment::CellContent(Envi(M),Col(M),Row(M)+1) $\neq$ No **implies** Row(Forward(M))
= Row(M) **and** Col(Forward(M)) = Col(M)

Face(M)=E **implies** Environment::CellNature(Envi(M),Col(M)+1,Row(M))
$\in \{EMP, DNO\}$
   and Col(M)+1 < Environment::Height(Envi(M))
   and Environment::CellContent(Envi(M),Col(M)+1,Row(M)) = No
   implies Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M)
+ 1

Face(M)=E **implies** Environment::CellNature(Envi(M),Col(M)+1,Row(M))
$\in \{EMP, DWO\}$ or Row(M) $\geq$ Environment::Width(Envi(M)) or Environment::CellContent(Envi(M),Col(M)+1,Row(M)) $\neq$ No **implies** Row(Forward(M))
= Row(M) **and** Col(Forward(M)) = Col(M)

Face(M)=N **implies** Environment::CellNature(Envi(M),Col(M),Row(M)-1) $\in \{EMP, DWO\}$ **and** Col(M)-1 $\geq$ 0 **and** Environment::CellContent(Envi(M),Col(M),Row(M)+1)
= No **implies** Row(Forward(M)) = Row(M) - 1 **and** Col(Forward(M)) =
Col(M)

Face(M)=N **implies** Environment::CellNature(Envi(M),Col(M),Row(M)-1) $\in \{EMP, DWO\}$ or Col(M)-1 < 0 or Environment::CellContent(Envi(M),Col(M),Row(M)-1) $\neq$ No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) =
Col(M)

Face(M)=W **implies** Environment::CellNature(Envi(M),Col(M)-1,Row(M))
$\in \{EMP, DNO\}$ **and** Row(M)-1 $\geq$ 0 **and** Environment::CellContent(Envi(M),Col(M)-1,Row(M)) = No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M))
= Col(M) - 1

Face(M)=W **implies** Environment::CellNature(Envi(M),Col(M)-1,Row(M))
$\in \{EMP, DNO\}$ or Row(M)-1 < 0 or Environment::CellContent(Envi(M),Col(M),Row(M)-1) $\neq$ No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) =
Col(M)

[Backward]:
Face(M)=N **implies** Environment::CellNature(Envi(M),Col(M),Row(M)+1)
$\in \{EMP, DWO\}$
   and Row(M)+1 < Environment::Width(Envi(M))
   and Environment::CellContent(Envi(M),Col(M),Row(M)+1) = No
   implies Row(Forward(M)) = Row(M) + 1
   and Col(Forward(M)) = Col(M)
Face(M)=N **implies** Environment::CellNature(Envi(M),Col(M),Row(M)+1)
$\in \{EMP, DWO\}$ or Row(M)+1 $\geq$ Environment::Width(Envi(M)) or Envi-

ronment::CellContent(Envi(M),Col(M),Row(M)+1) $\neq$ No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M)

Face(M)=W **implies** Environment::CellNature(Envi(M),Col(M)+1,Row(M)) $\in \{EMP, DNO\}$

   and Col(M)+1 $<$ Environment::Height(Envi(M))

   and Environment::CellContent(Envi(M),Col(M)+1,Row(M)) = No

   implies Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M) + 1

Face(M)=W **implies** Environment::CellNature(Envi(M),Col(M)+1,Row(M)) $\in \{EMP, DWO\}$ or Row(M) $\geq$ Environment::Width(Envi(M)) or Environment::CellContent(Envi(M),Col(M)+1,Row(M)) $\neq$ No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M)

Face(M)=S **implies** Environment::CellNature(Envi(M),Col(M),Row(M)-1) $\in \{EMP, DWO\}$ **and** Col(M)-1 $\geq$ 0 **and** Environment::CellContent(Envi(M),Col(M),Row(M)+1) = No **implies** Row(Forward(M)) = Row(M) - 1 **and** Col(Forward(M)) = Col(M)

Face(M)=S **implies** Environment::CellNature(Envi(M),Col(M),Row(M)-1) $\in \{EMP, DWO\}$ or Col(M)-1 $<$ 0 or Environment::CellContent(Envi(M),Col(M),Row(M)-1) $\neq$ No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M)

Face(M)=E **implies** Environment::CellNature(Envi(M),Col(M)-1,Row(M)) $\in \{EMP, DNO\}$ **and** Row(M)-1 $\geq$ 0 **and** Environment::CellContent(Envi(M),Col(M)-1,Row(M)) = No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M) - 1

Face(M)=E **implies** Environment::CellNature(Envi(M),Col(M)-1,Row(M)) $\in \{EMP, DNO\}$ or Row(M)-1 $<$ 0 or Environment::CellContent(Envi(M),Col(M),Row(M)-1) $\neq$ No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M)

   [StrafeR]:

Face(M)=N **implies** Environment::CellNature(Envi(M),Col(M)+1,Row(M)) $\in \{EMP, DNO\}$

   and Col(M)+1 $<$ Environment::Height(Envi(M))

   and Environment::CellContent(Envi(M),Col(M)+1,Row(M)) = No

   implies Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M) + 1

Face(M)=N **implies** Environment::CellNature(Envi(M),Col(M)+1,Row(M)) $\in \{EMP, DWO\}$ or Row(M) $\geq$ Environment::Width(Envi(M)) or Environment::CellContent(Envi(M),Col(M)+1,Row(M)) $\neq$ No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M)

Face(M)=S **implies** Environment::CellNature(Envi(M),Col(M)-1,Row(M))
$\in \{EMP, DNO\}$ **and** Row(M)-1 $\geq$ 0 **and** Environment::CellContent(Envi(M),Col(M)-1,Row(M)) = No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M) - 1

Face(M)=S **implies** Environment::CellNature(Envi(M),Col(M)-1,Row(M))
$\in \{EMP, DNO\}$ or Row(M)-1 $\geq$ 0 or Environment::CellContent(Envi(M),Col(M),Row(M)-1) $\neq$ No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M)

[StrafeL]:
Face(M)=S **implies** Environment::CellNature(Envi(M),Col(M)+1,Row(M))
$\in \{EMP, DNO\}$
  and Col(M)+1 < Environment::Height(Envi(M))
  and Environment::CellContent(Envi(M),Col(M)+1,Row(M)) = No
  implies Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M) + 1

Face(M)=S **implies** Environment::CellNature(Envi(M),Col(M)+1,Row(M))
$\in \{EMP, DWO\}$ or Row(M) $\leq$ Environment::Width(Envi(M)) or Environment::CellContent(Envi(M),Col(M)+1,Row(M)) $\neq$ No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M)

Face(M)=N **implies** Environment::CellNature(Envi(M),Col(M)-1,Row(M))
$\in \{EMP, DNO\}$ **and** Row(M)-1 $\geq$ 0 **and** Environment::CellContent(Envi(M),Col(M)-1,Row(M)) = No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M) - 1

Face(M)=N **implies** Environment::CellNature(Envi(M),Col(M)-1,Row(M))
$\in \{EMP, DNO\}$ or Row(M)-1 $\geq$ 0 or Environment::CellContent(Envi(M),Col(M),Row(M)-1) $\neq$ No **implies** Row(Forward(M)) = Row(M) **and** Col(Forward(M)) = Col(M)

[TurnLeft]:
Face(M)=N **implies** Face(TurnLeft(M))=W
Face(M)=W **implies** Face(TurnLeft(M))=S
Face(M)=S **implies** Face(TurnLeft(M))=E
Face(M)=E **implies** Face(TurnLeft(M))=N

[TurnRight]:
Face(M)=S **implies** Face(TurnRight(M))=W
Face(M)=E **implies** Face(TurnRight(M))=S
Face(M)=N **implies** Face(TurnRight(M))=E

Face(M)=W **implies** Face(TurnRight(M))=N