

# NPC Script (*Early idea specification*)

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## **Hello!**

*This is an early idea of NPC-AI subsystem for PGE Engine which was planned before lua was been used to implement NPC-AI subsystem. Lua allows much more, lua is fast, optimized, supports JIT-compilation (libLuaJIT) and supported by a wide community of programmers and users. Also many libraries for the C++ are been provided to support easy binding of native variables, functions, structures, classes, etc. Into the lua code. This documentation was kept as history part and will don't be used in future works. You may use this specification to implement and extend the interpreter of this language yourself.*

*If you looking for modern PGE-Lua API to make scripts and NPC-AI's for PGE Engine, please visit official wiki here: [http://wohlsoft.ru/pgewiki/Category:PGE-Lua\\_API](http://wohlsoft.ru/pgewiki/Category:PGE-Lua_API)*

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This is a declarative script language, using for programming algorithms of NPCs. The main language units are the states and events.

The NPC programm have two type: *parametric*, *algorithmic*.

The *Parametric* type using the basic parameters from config files and usign the default simple-moving alhorithm.

The *Algorithmic* type using the declared events and states in special file. This allows to NPC using itself working schemes.

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## System states

The states, applying by engine

<b>_DEFAULT</b>	Startup NPCs STATE
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## Physical states

The states, applying automatically by physical environment, where currently placed NPC

<b>_GROUND</b>	NPC stay on ground
<b>_AIR</b>	NPC flying/falling in air
<b>_UNDERWATER</b>	NPC under water
<b>_LAVA</b>	NPC stay on block, marked "as lava"

## System events

The events, what calling on game process events by engine

<b>_ACTIVATE</b>	NPC appeared on screen
<b>_DEACTIVATE</b>	NPC Deactivating, if it be offscreen 4 sec ago
<b>_KILL_JUMP</b>	Player jump to his head in flying state
<b>_KILL_SLIDE_SLOPE</b>	Player collided with NPC while he sliding on slope
<b>_KILL_BY_NPC</b>	Collided with NPC, what have option "HURT_NPC=TRUE"
<b>_KILL_FIREBALL</b>	Collided with NPC, marked as "fireball"
<b>_KILL_ICEBALL</b>	Collided with NPC, marked as "iceball"
<b>_KILL_HAMMER</b>	Collided with NPC, marked as "palyer's hammer"
<b>_KILL_BOMB</b>	Collided with bomb explosion zone (and player's bomb)
<b>_KILL_BOOMERANG</b>	Collided with NPC, marked as "boomerang"
<b>_KILL_TAIL</b>	Collided with player's sprite zone, placed in player's front, and have height=(player/2)
<b>_KILL_SPIN</b>	Player jump to his head in state "Spining"
<b>_KILL_BY_SHOE</b>	Player jump to his head with mounded items (Shoes, Yoshis, helicopter)
<b>_WAS_EATEN</b>	NPC was eaten by player's transport
<b>_ON_LAVA_COLLISION</b>	NPC was contacted with block, marked as "lava"
<b>_ON_CLIFF</b>	He collided with cliff
<b>_ON_DIE</b>	He died
<b>_ON_PLAYER_COLLISION</b>	He collided with player
<b>_ON_BLOCK_COLLISION</b>	he collided with block
<b>_ON_NPC_COLLISION</b>	he collided with NPC
<b>_ON_ANY_COLLISION</b>	he collided with any objects
<b>_ON_THROW</b>	He did be thowed by player or by generator
<b>_ON_PUT</b>	He did be puted by player or by generator
<b>_ON_TAKE</b>	NPC was taken by player
<b>_PHYSICAL_STATE_CHANGED</b>	If was changed the physical changed: example, NPC falled to water from air

## Language commands:

### Definators:

the user's comments in script  
`//comment`

define state with name XXXX

STATE XXXX:  
    <commands>

define event with name YYYY

EVENT YYYY:  
    <commands>

### Parametric:

set NPC's health as XX - default 1

SET\_HEALTH XX

set acceleration value to ZZ, if value 0 - speed changing instance

SET\_ACCELERATION ZZ

set speed in pixels per second

SET\_SPEED ZZ

change playing music by ID=YY

CHANGE\_MUSIC YY

Play sound with ID=YY

PLAY\_SOUND YY

Events and states:

NPC's state to state with name ZZZZ

CHANGE\_STATE ZZZZ

Call to defined event with name XXXX

\_CALL XXXX

All of NPC's:

Subtract the number with value=YY from NPC's health. If health <=0 - NPC was died

APPLY\_DAMAGE YY

Transform NPC to NPC with ID value=YY

TRANSFORM\_TO\_NPC YY

Transform to NPC-container with ID=YY and put this NPC into him

PACKINTO\_NPC YY

Kill packed NPC:

DESTROY\_PACKED

Spawn other NPC with ID=YY

SPAWN YY

SPAWN YY TYPE DIRECTION SPEED

Spawn NPC with ID=YY, with TYPE (PROJECTIVE, PUT),  
direction (UP DOWN LEFT RIGTH TOPLAYER[ 350 25 ] 45 )  
with speed with value=SPEED

directions:

UP DOWN LEFT RIGTH FRONT REAR	static direction
TOPLAYER	ind player's center position and calculate direction
TOPBOTTOM	find player's bottom position and calculate direction
TOPLAYER[ 350 25 ]	find player's position and calculate direction params - corner gradus limits
45	static gradus direction, relative to NPC's h-front
RAND	Random without gradus limits
RAND[ 350 25 ]	set random direction in slected gradus range

start NPCs movement with speed fade (need to declare acceleration)

DO\_RUN

Stop with speed fade (need to declare acceleration)

DO\_STOP

Force deactivate NPC and return it on his start position

DO\_DEACTIVATE

Jump UP NPC with vertical INERTIA SPEED

JUMP YY

Kill this NPC:

DIE

*Define animations and graphics:*

set static frame number XX (0-n frames on animated sprite)

SET\_C\_FRAME XX

set animation with framelist (example [ 1 2 3 4 5 ] ) with loop.

SET\_ANIMATION [ framelist ] ANITYPE

Where ANITYPE - is NPCs physical state:

GROUND, AIR, UNDERWATER or ANY

show non-loop animation with frame-delay value=YYY and set as static the last frame in defined framelist

SET\_F\_FRAME [ framelist ] YYY

set animation frame delay in milliseconds

SET\_FRAMESPEED ZZ

Effects:

Start effect animation on NPCs position (dynamic effects will use his default settings)

`DO_EFFECT YY`

Start dynamic effect with defined properties

`DY_EFFECT YY POSITION DIR SPEED`

*position:*

`CENTER, POS[ 12 44 ]` (relative at NPC's current position)

*direction:*

<code>LEFT RIGHT UP DOWN FRONT REAR</code>	static directions
<code>TO_PLAYER</code>	find player's center position and calculate direction
<code>TO_PBOTTOM</code>	find player's bottom position and calculate direction
<code>TO_PLAYER[ 350 25 ]</code>	find player's position and calculate direction params - corner gradus limits
<code>45</code>	static gradus direction, relative to NPC's h-front
<code>RAND</code>	Random without gradus limits
<code>RAND[ 350 25 ]</code>	set random direction in slected gradus range

You can use `TO_PLAYER, FRONT` or `TOPBOTTOM, FRONT` for spawn effect on NPC's FRONT if collosion with player has not detected

*Speed movement:*

Dynamic effect speed declaring in pixels per second

*Modify player state: (Will be modified only with player, what collided with NPC)*

Change Mounted objects on player:

`SET_MOUNTED XX YY`

XX – Mount type (0 – nothing, 1 – show, 2 – helicopter, 3 – horse/dinosaur)

YY – mounted object ID:

Shoes: 1-3

helicopters: 1-2

horses: 1-8

Change player's power-up state:

`SET_PLAYER_STATE XX`

XX – Player's state number: 1-7:

1 – small, 2 – big, 3 – fire, 4 – raccoon, 5 – tanooki, 6 – hammer, 7 - ice

## Detectors

Detectors allow to call events on object detection

Set detector on current state (if current state was changed, detector will be disabled):

**SET\_DETECTOR OBJECT DISTANCE XX DIRECT EVENT**

### *Object:*

<b>BLOCK</b>	Detect block
<b>BLOCKID YY</b>	Detect block with ID value=YY
<b>PLAYER</b>	Detect playable characyer
<b>NPC</b>	Detect any NPC
<b>NPCID YY</b>	Detect NPC with ID value=YY
<b>BGO</b>	Detect any BGO
<b>BGOID YY</b>	Detect BGO with ID value=YY

### *Detection type:*

<b>DISTANCE</b>	detect object on approximations by distance radius (square) value=XX
<b>DISTANCE_H</b>	detect object on horisontal approximations by distance value=XX
<b>DISTANCE_V</b>	detect object on vertical approximations by distance value=XX
<b>COLLISION</b>	detect object on collision with them

### *Detector directions:*

<b>ANY</b>	Allow detect in all directions
<b>TOP, BOTTOM, FRONT, BACK, TOP_FRONT, TOP_BACK, BOTTOM_FRONT, BOTTOM_BACK</b>	Use direction limit for object detection

**EVENT** - call global or user defined event if detector was passed

### Conditional expressions:

Single:

```
IF [ expression ]  
[  
<commands>  
]
```

Double: True/False actions:

```
IF [ expression ]  
[  
<commands>  
]  
ELSE  
[  
<commands>  
]
```

Expressions:

*Single:*

```
[ VALUE op VALUE ]
```

*Multiple:*

```
[ [ VALUE1 = VALUE2 ] && [ VALUE1 != VALUE3 ] ]
```

### Operators:

```
= > < >= <= !=
```

*Logical (if you checking many expressions):*

```
&& ||
```

### Timer:

The timer will run your commands after his timeout  
set timer on YYY milliseconds

```
SET_TIMER YYY  
[  
<commands>  
]
```

Looped timer with YYY delay

```
SET_TIMER_LOOP YYY  
[  
<commands>  
]
```

Timer will reset, if state with defined timer, changed



## NPCs Options:

change system NPCs options

SET\_OPT OPTION YYY

Get current option value:

OPT\_OPTION

Options table:

<b>Option</b>	<b>Values</b>	<b>Description</b>
HURT_PLAYER	TRUE/FALSE	NPC will hurt the player
HURT_NPC	TRUE/FALSE	NPC will hurt the other NPC
EATABLE	TRUE/FALSE	NPC can be eaten by Yoshi
SLIDE_SLOPE	TRUE/FALSE	NPC can be kicked on slope slide
JUMPED	TRUE/FALSE	NPC can be kicked on head-jump
DEACTIVATION	TRUE/FALSE	NPC will deactivate on off-screen 4 sec ago
KICKEDBYNPC	TRUE/FALSE	NPC can be kicked by other NPC
FIREBALL	TRUE/FALSE	NPC can be kicked on fire ball
ICEBALL	TRUE/FALSE	NPC can be freeze on ice ball
HAMMER	TRUE/FALSE	NPC can be kicked on hammer
ALLOW_TAIL	TRUE/FALSE	NPC can be kicked by tail
ALLOW_SPIN	TRUE/FALSE	NPC can be kicked on spin
ALLOW_SHOE	TRUE/FALSE	NPC can be kicked on mounted objects
CLIFF_DETECT	TRUE/FALSE	NPC will detect cliffs on movements
EFFECT	UNSIGNED INTEGER	Default “die” effect ID
SH_EFFECT	UNSIGNED INTEGER	Default “kicked” effect ID
SCORE	0-12	Give Score to player on kick NPC
GRAVITY	TRUE/FALSE	Enable/disable gravity
GRAB_SIDE	TRUE/FALSE	NPC can be grabbed on side
GRAB_TOP	TRUE/FALSE	NPC can be grabbed on top
GRAB_ANY	TRUE/FALSE	NPC can be grabbed on any collisions
TAKABLE	TRUE/FALSE	NPC can be takes by player
LAVA_PROT	TRUE/FALSE	NPC will not burn in lava
ADHESION	TRUE/FALSE	Allows to NPC walking on walls and on ceiling
D_HEALTH	UNSIGNED INTEGER	Default NPC's health
SPECIAL	INTEGER	Special option
CONTAINER	TRUE/FALSE	This NPC is – container. Special value is a containing NPC