BuildTheHTMLPage

Team id:PNT2022TMID00782

```
<!DOCTYPEHTMLPUBLIC"-
//W3C//DTDHTML4.01//EN"
"http://www.w3.org/TR/html4/strict.dtd">
    <html>
    <head>
        <meta http-equiv="Content-
Type"content="text/html;charset=UTF-8">
        <title>Artificial intelligence : OpenKore sourcecodedocumentation</title>
        <link rel="stylesheet" type="text/css"href="openkore.css">
            <!--FixbrokenPNGtransparencyforIE/Win5-6+-
    ->
        <!--[ifgteIE5.5000]>
        <script
  type="text/javascript"src="pngfix.js"></script>
        <![endif]-->

        <styletype="text/css">
        <!--
        .example { margin: 0.3cm;margin-
            left:0.5cm;
        }
        .comment{font-style:italic;
```

```
                }
                .term { border-bottom: 1px dottedblack;
                }
                .cstr{color:
                                #007700;
                }
                -->
                </style>
</head>

<body>

 <divid="title">OpenKoresourcecodedocumentation</div>

 <divid="navigation">
                <ul>
                <li><ahref="http://openkore.sourceforge.net/">Mainwebsite</a></li>
                <li><a href="index.html">Table ofcontents</a></li>
                <li><b>Artificialintelligence</b></li>
                </ul>
 </div>

 <divid="main">

 <h1>HowtheAIsubsystemisdesigned</h1>
```

The AI subsystem isn't really complex, but it could takeawhileto understandit'sdesign.

<p>

All"intelligence"ishandledinsidethe
<code>AI()</code> function (right now it's one

bigfunctionbutwehopetosplititinthefuture).

As explained in the <a>Main loop & initializationpage, the <code>AI()</code> function only runs less thanafractionofasecond.

<p>

Basically,theAItellsKoretodocertainthingsbasedon the current situation. I'll try to explain it withsomeexamples.

<aname="ex1">

<h2>Example1:Randomwalk</h2>

You'reprobablyfamiliarwithKore'srandomwalkfeature.

If there are no monsters and Kore isn't doing anything,it will walk to a random spot on the map, and attack anymonstersitencounters.

The following piece of code (within the <code>AI()</code>function makes Kore walk to a random spot if it isn'tdoing anything:

<preclass="example">

```
1                   <span class="comment">##### RANDOM WALK#####</span>
2                   <b>if</b>($config{'route_randomWalk'}&&
                    $ai_seq[0]
```

eq""&&@{$field{'field'}}>1&&
!$cities_lut{$field{'name'}.'.rsw'}){

3 # Find a randomblock on the map
that we can walkon

4 do{

5 $ai_v{'temp'}{'randX'} = int(rand() *($field{'width'}-1));

6 $ai_v{'temp'}{'randY'} = int(rand() *($field{'height'} -1));

7 } while($field{'field'}[$ai_v{'temp'}{'randY'}*$field{'width'}+
$ai_v{'temp'}{'randX'}]);8

9 # Move to thatblock

10 message "Calculatingrandom routeto:
$maps_lut{$field{'name'}.'.rsw'}($field{'name'}):
$ai_v{'temp'}{'randX'},$ai_v{'temp'}{'randY'}\n",
<spanclass="cstr">"route";

11 ai_route(\%{$ai_v{'temp'}{'returnHash'}},

12 $ai_v{'temp'}{'randX'},

13 $ai_v{'temp'}{'randY'},

14 $field{'name'},

15 0,

16 $config{'route_randomWalk_maxRouteTime'},

17 2,

18 undef,

19 undef,

20 1);

21 }

</pre>

We call this block of code an AI codeblock.

In other words, an AI code block is an entire blockofcodewhichdealswithacertainpartof theAI.

<h3>Situation check</h3>Inline1, it

checks:

whethertheconfigurationoption <code>route_randomWalk</code>ison

whether there are currently no other active <emclass="term">AIsequences(seebelow)

whetherwe'recurrentlyNOTinacity

If all of the above is true, then Kore will run the codeinside thebrackets.

<p>

What is an AI sequence? It is avaluewithinthe<code>@ai_seq</code> array.

Thisarrayisacommandqueue.

<p>

AI code blocks prepend values into this array so they canknowwhen it'stheirturntodosomething.

When an AI code block is done with it's task, it willremove thatvaluefrom thearray.

So, if <code>@ai_seq</code> is empty, then that means allAI code blocks have finished and Kore isn't doinganythingelse.

AndthisiswhentherandomwalkAIcodeblock jumpsin.

<p>

There is also the <code>@ai_seq_args</code> array, usedto store temporary variables used by the current AI codeblock.

If a value is prepended into <code>@ai_seq</code>, then avalue mustalsobeprependedinto <code>@ai_seq_args</code>.Moreonthislater.

<h3>Findingarandompositiontowalkto</h3>

Line 4-7 tries to find a random position in the map thatyoucanwalkon.

(<code>$field{field}</code> is a reference to an arraywhichcontainsinformationaboutwhichblocksyoucanandcan't walkon.

But that's not important in this example. You just havetounderstand what thisblockdoes.)

<p>

Theresultcoordinateisputintothesetwovariables:

<code>$ai_v{temp}{randX}</code>

<code>$ai_v{temp}{randY}</code>

<small>(In case you didn't know,
<code>$foo{bar}</code>isthesameas<code>$foo{'bar'}</code>.)</small>

<h3>Moving</h3>

Line11-20isthecodewhichtellsKoretomovetotherandom position.

Ittells<code>ai_route()</code>whereitwants togoto.

<code>ai_route()</code> prepends a <code>"route"</code>AI sequence in <code>@ai_seq</code>, and arguments in ahash

(which is then prepended into <code>@ai_seq_args</code>andimmediatelyreturns.

Shortly after this, the entire <code>AI()</code> functionreturns.

The point is, <code>ai_route()</code> is notsynchronous.

<p>

Inlessthanafractionofasecond,the
<code>AI()</code>functioniscalledagain.

Because the <code>@ai_seq</code> variable is not
emptyanymore,therandomwalkAIcodeblockisnever activated

(the expression <code>'$ai_seq[0] eq ""</code> isfalse).

<p>

The AI code block that handles routing is elsewhere inthe<code>AI()</code>function.

Itseesthatthefirstvaluein<code>@ai_seq</code>is
<code>"route"</code>,andthinks"hey,nowit'smyturntodo something!".

(The route AI code block is very complex so I'm not goingtoexplain whatitdoes,
butyougettheidea.)

When the route AI code block has finished, it will removethefirst item
from<code>@ai_seq</code>.

If <code>@ai_seq</code> is empty, then the random routeAIcodeblock isactivatedagain.

<h2>Example 2: Attacking monsters while walking to arandom spot</h2>

YoumightwanttowonderhowKoreisabletodeterminewhetherto attack monsterswhenit'swalking.

Let'stakealook atasmallpiece ofit'ssourcecode:

<preclass="example">

<spanclass="comment">#####AUTO-ATTACK#####

if (($ai_seq[0] eq <spanclass="cstr">"" || $ai_seq[0] eq
<spanclass="cstr">"route" || $ai_seq[0] eq
<spanclass="cstr">"route_getRoute"||$ai_seq[0]
eq<spanclass="cstr">"route_getMapRoute"
|| $ai_seq[0] eq
<spanclass="cstr">"follow"

|| $ai_seq[0] eq
<spanclass="cstr">"sitAuto"||$ai_seq[0]eq
<spanclass="cstr">"take"||$ai_seq[0]eq
<spanclass="cstr">"items_gather"||$ai_seq[0]
eq<spanclass="cstr">"items_take")

...

</pre>

As you can see here, the auto-attack AI code block is runifany of theaboveAI sequencesareactive.

So when Kore is walking (<code>$ai_seq_args[0]</code>
is"route"),Korecontinuestocheckformonsterstoattack.

<p>

Butasyoumayknow,ifyoumanuallytype"moveWhateEverMapName"intheconsole,Korewillmovet
othatmapwithoutattacking

monsters (yes, this is intentional behavior). Why isthat?

<p>

As seen in example 1, the <code>ai_route()</code>functioninitializesthe
routeAIsequence.

Thatfunctionacceptsaparametercalled"attackOnRoute".
<code>$ai_seq_args[0]{attackOnRoute}</code> is set to thesamevalueas thisparameter.

Kore will only attack monsters while moving, if thatparameter issetto1.

Whenyoutype"move"intheconsole,thatparameterissetto 0. The random walk AI code block however sets thatparameter to1.

<p>

Inside the auto-attack AI code block, Kore checks whetherthe argument hash that's associated with the "route" AIsequencehasa

'attack0nRoute'key,andwhetherthevalueis1.

<preclass="example">

...

$ai_v{'temp'}{'ai_route_index'}=binFind(\@ai_seq,
<spanclass="cstr">"route");

if ($ai_v{'temp'}{'ai_route_index'} ne <spanclass="cstr">""){

$ai_v{'temp'}{'ai_route_attackOnRoute'}=
$ai_seq_args[$ai_v{'temp'}{'ai_route_index'}]{'attackOnRoute'};

}

...

Somewhere else in the auto-attackAI code
block,Korechecks whether

$ai_v{'temp'}{'ai_route_attackOnRoute'} is set to1.

</pre>

<h2>Timeouts:Towaita whilebeforedoingsomething</h2>

In certain cases you may want the program to wait a whilebefore doinganythingelse.

Forexample,youmaywanttosenda"talktoNPC"packettotheserver,thensenda"chooseNPCmenuitem2
"packet
2secondslater.

<p>

Thefirstthingyouwouldthinkof isprobably tousethe
<code>sleep()</code>function.

However, that is a bad idea. <code>sleep()</code> blocksthe entire program. During the sleep, nothing else can beperformed.

User command input will not work, other AI sequences arenotrun,networkdataisnotreceived, etc.

<p>

The right thing to do is to use the
<ahref="Utils.html#timeOut"><code>timeOut()</code>function.

The API documentation entry for that function has
twoexamples.Here'sanotherexample,demonstratinghow

you can use the timeOut() function in an AI sequence.ThisexampleinitializesaconversationwithNPC1337(aKapra NPC).

Then two seconds later, it sends a "choose NPC menu item2"packet.

<preclass="example">

The AI() function is run in themainloop

subAI{

...

if($somethingHappened){

my%args;

$args{stage}=<spanclass="cstr">'Just started';

unshift @ai_seq, <spanclass="cstr">"NpcExample";

unshift@ai_seq_args,\%args;

$somethingHappened=0;

}

if ($ai_seq[0] eq <spanclass="cstr">"NpcExample"){

if($ai_seq_args[0]{stage} eq<spanclass="cstr">'Juststarted'){

<spanclass="comment">#ThisAI

```
      sequencejuststarted

                                                #Initializeaconversationwith
 NPC1337</span>

                                        sendTalk($net,1337);


                                        <span class="comment"># Store
thecurrenttimeinavariable</span>

$ai_seq_args[0]{waitTwoSecs}{time}=<b>time</b>;

                                        <span class="comment"># We
wanttowaittwoseconds</span>

$ai_seq_args[0]{waitTwoSecs}{timeout}=2;


                                        $ai_seq_args[0]{stage} =
<spanclass="cstr">'Initializedconversation'</span>;


                                }<b>elsif</b>($ai_seq_args[0]{stage}
<b>eq</b>                    <span
class="cstr">'Initializedconversation'</span>

                                    <span class="comment"># This
'if'statementisonlytrue iftwo seconds havepassed

                                    #since
$ai_seq_args[0]{waitTwoSecs}{time}isset</span>

                                    &&timeOut(
$ai_seq_args[0]{waitTwoSecs})

                                ){

                                    <span class="comment"># 
Twosecondshavenowpassed</span>

                                    sendTalkResponse($net,1337,2);

                                    <span  class="comment"># We'redone;
removethis  Alsequence</span>
```

shift@ai_seq;

shift@ai_seq_args;

}

}

...

}

</pre>

<h2>Conclusion&summary</h2>

The entire AI subsystem is kept together by these twovariables:

<code>@ai_seq</code> : a queue which contains AIsequencenames.

Usually, AI code blocks are run based on the value of thefirst itemin thequeue

(though this doesn't have to be true; it depends on howtheAI codeblockisprogrammed).

<code>@ai_seq_args</code> : contains arguments that'sassociated withcurrentAIsequence.

The design is pretty simple. This allows the system to beveryflexible:

you can do pretty much anything you want. There aren'tmanyreallimitations

(butthat'sjustmyopinion).

<p>

The <code>AI()</code> function runs only very shortly. SoAI code blocks shouldn't do anything that can block thefunctionforalongtime.

<h3>Glossary</h3>

An AI code block is an entireblock of code which deals with a certain part of theAI.

An AI sequence is a valuewithinthe<code>@ai_seq</code>queue(andanassociatedvalueinsidethe<code>@ai_seq_args</code>array).

<p><hr><p>

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<ahref="http://www.mozilla.org/products/firefox/"title="If

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you were looking at thispagein any browser butMicrosoft Internet Explorer, it would look and run betterand faster"><img width="45" height="45"src="http://linuxart.com/img/noIE-small.png" alt="If youwere looking at this page in any browser but MicrosoftInternet Explorer, it would look and run better andfaster"></a></li>

            </ul>

</div>


</div>


</body>

</html>
```