

COM S 229, Spring 2015

Programming Project 1.05

Parsing Monster Definitions

We've been randomly generating our NPCs, and while that's not a totally unworkable way to build a real game, it does have some major disadvantages; for instance, it prevents the player from recognizing monsters and knowing, from previous encounters, what to expect from them. As Roguelikes are tactics games, knowing what to expect is essential to success. We've also been very simplistic, with no concept of hitpoints, attack strength, defensive abilities, etc. It's time to increase the complexity of our NPCs and our PC.

To create more complex NPCs, we could hard code all of the monsters we want. That's as simple as defining an NPC structure, creating an array of them, one for each monster, and assigning values to the fields. Problem solved. And if I think of an interesting, new monster that I want to add to the game? I need to increase the size of the array, set the fields in the new slot, and recompile. So, essentially, only a developer can do it. A more flexible method will use a text file in which monsters are defined; the game only needs to know how to parse it, and we can change, add, and remove all the monsters we want without ever recompiling.

We're thinking about defining an editable file format to describe NPCs, so, in fact, we're thinking about defining a language and implementing a parser for it. Language design and parsing in the general sense are beyond the scope of this course, but we already know enough to be able to scan tokens from the input with clearly defined delimiters, so we'll design our language so that it is simple enough that we can easily parse it with the tools we have. Students who are interested in implementing more complex monster definition files with more complex parsing requirements should look into *lex*, *yacc*, and *recursive descent*.

What characteristics do we want our monsters to have? So far, they have a symbol, a speed, and a telepathy state (yes or no), and an intelligence level. These provide a good start. Let's add a color, a name, a description, hitpoints (health), attack damage, and a general "abilities" field, where *intelligence* and *telepathy* are just two possibilities. Later we'll add other things, including types of attacks: dragons can breathe fire, basilisks can paralyze with a look, and sorcerers can cast spells.

Many of these things are numeric. We could provide a mean and a standard deviation, then roll for a value from a Gaussian. But this is a role-playing game. Role-playing games traditionally use dice, and we're going to stick with tradition on this. We'll specify our values with the format:

$$\langle base \rangle + \langle dice \rangle \text{ d } \langle sides \rangle$$

where $\langle base \rangle$ is a constant offset (maybe zero), $\langle dice \rangle$ is the number of dice to roll (also maybe zero), and $\langle sides \rangle$ is the number of sides on each of those dice. So a numerical specification of $9+3d8$ means to roll a number with a minimum value of 12, a maximum value of 33, and an expected value of 22.5. The distribution of rolls looks like this:

Roll	Probability	Cumulative Probability
12	0.2	0.2
13	0.6	0.8
14	1.2	2.0
15	2.0	3.9
16	2.9	6.8
17	4.1	10.9
18	5.5	16.4
19	7.0	23.4
20	8.2	31.6
21	9.0	40.6
22	9.4	50.0
23	9.4	59.4
24	9.0	68.4
25	8.2	76.6
26	7.0	83.6
27	5.5	89.1
28	4.1	93.2
29	2.9	96.1
30	2.0	98.0
31	1.2	99.2
32	0.6	99.8
33	0.2	100.0

Let's define some keywords for all of the parameters of our monsters:

Parameter	Keyword	Description
Name	NAME	A name to describe the monster, for example, a "slime", an "amazon", a "wyvern", or "Sauron". Terminated by a newline
Description	DESC	A textual description of the monster. Beginning on the next line after the keyword, terminated by a period on a line by itself, and limited to a width of 77 characters.
Symbol	SYMB	A single ASCII letter to represent the monster in the dungeon, followed by a newline.
Color	COLOR	A color name keyword (see color information below), used to color the monster in the dungeon (not implemented yet), followed by a newline.
Speed	SPEED	A numerical value (as defined above) describing the speed of a monster, followed by a newline
Abilities	ABIL	List of space-delineated abilities keywords. For now, we've got SMART, for smart monsters, TELE, for telepathic monsters, TUNNEL for monsters that can tunnel through rock, and PASS, for non-corporeal monsters, like ghosts, that can pass through matter without damaging it, followed by a newline.
Hitpoints	HP	A numerical value describing the amount of damage a monster can take, followed by a newline.
Attack Damage	DAM	A numerical value describing the amount of damage a monster can inflict per attack, followed by a newline.

Ncurses allows us to display in color, assuming it's supported by the terminal. We'll define the following colors: RED, GREEN, BLUE, CYAN, YELLOW, MAGENTA, WHITE, BLACK. When we start loading these new monsters, we'll also start rendering them in color.

Let's also add some keywords to start and end each entry:

START MONSTER

on a line by itself to mark the start of a new NPC, and

END

on a line by itself to mark the end.

Any parser error discards the current monster; the parser scans for the next occurrence of START MONSTER and continues processing from there.

We'll also add some metadata to start the file for versioning:

RLG229 MONSTER DESCRIPTION 1

should be the first line.

An example of a monster description file with two entries is listed on the following page.

RLG229 MONSTER DESCRIPTION 1

BEGIN MONSTER

NAME Junior Barbarian

SYMB p

COLOR BLUE

DESC

This is a junior barbarian. He--or is it she? You can't tell for sure-- looks like... it should still be in barbarian school. The barbarians are putting them in the dungeons young these days. It's wearing dirty, tattered cloth armor and wielding a wooden sword. You have a hard time feeling intimidated.

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SPEED 7+1d4

DAM 0+1d4

HP 12+2d6

ABIL SMART

END

BEGIN MONSTER

NAME Amazon Lich Queen

DESC

She was a powerful Amazon warrior in life. Death at the hands of the undead hordes was followed by her resurrection through dark, necromantic arts. Her power in life didn't approach her undead glory. Clad in night-black robes that don't move in the wind, her incorporeal form commands the power of death over life. You may just be her next victim. You fear for your soul as you quake before her malevolent majesty.

.

SYMB p

COLOR BLACK

ABIL SMART PASS

DAM 30+5d9

HP 3000

SPEED 10+10d2

END