

1. What is wrong with the original code that eventually causes it to crash? (Obviously, the program fails because of an invalid memory reference producing a segmentation fault -- what programming error led to the seg fault?)

The original code does not allocate memory correctly to the variable used that's called "the\_printed\_command\_except\_trap", which is then later referenced, causing the segmentation fault. The programming error is in the form of leaving out a useful call to "savestring(...)" in order to properly allocate the memory when assigning this variable's value.

2. Describe how you diagnosed the problem with the original code. If you used GDB, which commands did you find most helpful? If you did not, what tools were most helpful in diagnosing the problem?

Using GDB, I was able to first, locate the source of the problem after viewing the output upon execution. The output was:

```
malloc: execute.cmd.c:3672: assertion botched
free: called with already freed block argument
Aborting...Makefile:13: recipe for target 'test' failed
```

With this output, I opened execute\_cmd.c and navigated to line 3672, where I found code:

```
FREE (the_printed_command_except_trap);
the_printed_command_except_trap = the_printed_command;
```

Of course, I don't know what I'm looking at, so I had to do some digging. I first did some research on "the\_printed\_command" by doing a quick Ctrl+F search. This is of type extern char, and it's a pointer, so there's definitely some memory problems associated with the way this variable was saved. Next, I looked where this variable was being used in other sections of the program, and low and behold, I found a similar chunk of code in several locations in this file:

```
FREE (the_printed_command_except_trap);
the_printed_command_except_trap = savestring (the_printed_command);
```

So, it looks like this variable "the\_printed\_command\_except\_trap" needs to not be assigned directly to "the\_printed\_command", but from whatever savestring returns with this input. After changing the code to the second section given here, the program ran without error and the segmentation fault was resolved.

3. Describe how your solution fixes the problem. Are you confident your solution is correct?

My solution fixes the problem because it properly allocates memory to the variable in question, and I'm confident the solution is correct because it is consistent with the rest of the program file.