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fact_minix_cc.txt

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```

1  /*//////////////////////////////////////////////////////////////////
2  //      fact.c program to test a recursive call in C
3  //      M. Mizuno (c) 1995, 2004, 2005
4  //      modified for Learning Tree course 223P
5  /*//////////////////////////////////////////////////////////////////
6  /* Draw memory image of execution of the following program */
7  int ans;
8
9  void fact(int i)
10 {
11     /* what will happen if x is declared as internal static */
12     int x;
13
14     x = i - 1;
15     if ((i == 0) || (x == 0)) ans = 1;
16     else {
17         fact(x);
18         ans = (x + 1) * ans;
19     }
20 }
21
22 int main(void)
23 {
24     fact(3);
25     printf("answer = %d\n", ans);
26     return 0;
27 }
28

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```

29 .sect .text; .sect .rom; .sect .data; .sect .bss
30 .extern _fact
31 .sect .text
32
33 ;      void fact(int i)
34 ;      {
35 ;          int x;
36 _fact:
37 push ebp
38 mov ebp,esp
39 push esi          ; esi is used as a register variable for x
40
41 ;          x = i - 1;
42 mov edx,8(ebp)    ; edx <- i
43 dec edx
44 mov esi,edx        ; x <- i - 1;
45
46 ;          if ((i == 0) || (x == 0))
47 cmp 8(ebp),0      ; i - 0
48 je I1_3           ; jump if (i == 0) : I1_3 is the beginning of "then"
49 test esi,esi      ; x && x
50 jne I1_4           ; jump if (x != 0) : I1_4 is the beginning of "else"
51 I1_3:              ; "then"
52
53 ;              ans = 1;
54 ;          }
55 mov (_ans),1      ; ans = 1;
56 jmp I1_1           ; I1_1 is right after the if statement
57 I1_4:              ; "else"
58
59 ;          else
60 ;          {
61 ;              fact(x);
62 push esi          ; push x
63 call _fact
64 pop ecx           ; deallocate the pushed variable (x)
65
66 ;              ans = (x+1) * ans;   ans in RHS has the result of fact(x)
67 mov edx,esi
68 inc edx
69 imul edx,(_ans)
70 mov (_ans),edx
71
72 ;          }
73 I1_1:
74 pop esi ; esp += 4
75 leave  ; mov esp, ebp   and pop ebp
76 ret
77 .extern _main
78
79 ;      int main(void)
80 ;      {
81 _main:
82 push ebp
83 mov ebp,esp
84 ;          fact(3);
85 push 3
86 call _fact
87 pop ecx          ; esp += 4
88
89 ;          printf("answer = %d\n", ans);
90 push (_ans)
91 push I_1
92 call _printf
93 pop ecx          ; esp += 4
94 pop ecx          ; esp += 4
95 ;          return 0;
96 ;      }
97 xor eax,eax
98 leave
99 ret
100 .sect .rom
101 I_1: ; "answer = %d\n"

```

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```

102 .data4 1936618337
103 .data4 544367991
104 .data4 1680154685
105 .extern _ans
106 .data4 10
107 .sect .bss
108 .comm _ans,4
109 .sect .text
110

```

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```

111 .sect .text; .sect .rom; .sect .data; .sect .bss
112 .extern _fact
113 .sect .text
114 _fact:
115 push ebp
116 mov ebp,esp
117 push esi
118 mov edx,8(ebp)
119 dec edx
120 mov esi,edx
121 cmp 8(ebp),0
122 je I1_3
123 test esi,esi
124 jne I1_4
125 I1_3:
126 mov (_ans),1
127 jmp I1_1
128 I1_4:
129 push esi
130 call _fact
131 pop ecx
132 mov edx,esi
133 inc edx
134 imul edx,(_ans)
135 mov (_ans),edx
136 I1_1:
137 pop esi
138 leave
139 ret
140 .extern _main
141 _main:
142 push ebp
143 mov ebp,esp
144 push 3
145 call _fact
146 pop ecx
147 push (_ans)
148 push I_1
149 call _printf
150 pop ecx
151 pop ecx
152 xor eax,eax
153 leave
154 ret
155 .sect .rom
156 I_1:
157 .data4 1936618337
158 .data4 544367991
159 .data4 1680154685
160 .extern _ans
161 .data4 10
162 .sect .bss
163 .comm _ans,4
164 .sect .text

```