```c
1
2   /*  -*- Last-Edit:  Fri Jan 29 11:13:27 1993 by Tarak S. Goradia; -*- */
3   /* $Log: tcas.c,v $
4    * Revision 1.2  1993/03/12  19:29:50  foster
5    * Correct logic bug which didn't allow output of 2 - hf
6    * */
7
8   #include <stdio.h>
9
10  #define OLEV        600         /* in feets/minute */
11  #define MAXALTDIFF  600         /* max altitude difference in feet */
12  #define MINSEP      300         /* min separation in feet */
13  #define NOZCROSS    100         /* in feet */
14  /* variables */
15
16  typedef int bool;
17
18  int Cur_Vertical_Sep;
19  bool High_Confidence;
20  bool Two_of_Three_Reports_Valid;
21
22  int Own_Tracked_Alt;
23  int Own_Tracked_Alt_Rate;
24  int Other_Tracked_Alt;
25
26  int Alt_Layer_Value;            /* 0, 1, 2, 3 */
27  // ********************************** //
28  //int Positive_RA_Alt_Thresh[4];
29  int Positive_RA_Alt_Thresh_0;
30  int Positive_RA_Alt_Thresh_1;
31  int Positive_RA_Alt_Thresh_2;
32  int Positive_RA_Alt_Thresh_3;
33  // ********************************** //
34
35  int Up_Separation;
36  int Down_Separation;
37
38  /* state variables */
39  int Other_RAC;                  /* NO_INTENT, DO_NOT_CLIMB, DO_NOT_DESCEND */
40  #define NO_INTENT 0
41  #define DO_NOT_CLIMB 1
42  #define DO_NOT_DESCEND 2
43
44  int Other_Capability;          /* TCAS_TA, OTHER */
45  #define TCAS_TA 1
46  #define OTHER 2
47
48  int Climb_Inhibit;             /* true/false */
49
50  #define UNRESOLVED 0
51  #define UPWARD_RA 1
52  #define DOWNWARD_RA 2
53
54  void initialize()
55  {
56      // ********************************** //
57      //Positive_RA_Alt_Thresh[0] = 400;
58      //Positive_RA_Alt_Thresh[1] = 500;
59      //Positive_RA_Alt_Thresh[2] = 640;
60      //Positive_RA_Alt_Thresh[3] = 740;
61      Positive_RA_Alt_Thresh_0 = 400;
62      Positive_RA_Alt_Thresh_1 = 500;
63      Positive_RA_Alt_Thresh_2 = 640;
64      Positive_RA_Alt_Thresh_3 = 740;
65      // ********************************** //
66  }
67
68  int ALIM ()
69  {
70      // ********************************** //
71      if (Alt_Layer_Value==0) {
72          return Positive_RA_Alt_Thresh_0;
```

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74      }
75      else if (Alt_Layer_Value==1) {
76          return Positive_RA_Alt_Thresh_1;
77      }
78      else if (Alt_Layer_Value==2) {
79          return Positive_RA_Alt_Thresh_2;
80      }
81      else if (Alt_Layer_Value==3) {
82          return Positive_RA_Alt_Thresh_3;
83      } else {
84          return 0;
85      }
86      //return Positive_RA_Alt_Thresh[Alt_Layer_Value];
87      // ********************************** //
88
89  }
90
91  int Inhibit_Biased_Climb ()
92  {
93      return (Climb_Inhibit ? Up_Separation + NOZCROSS : Up_Separation);
94  }
95
96  bool Non_Crossing_Biased_Climb()
97  {
98      int upward_preferred;
99      int upward_crossing_situation;
100     bool result;
101
102     upward_preferred = Inhibit_Biased_Climb() > Down_Separation;
103     if (upward_preferred)
104     {
105         result = !(Own_Below_Threat()) || ((Own_Below_Threat()) && (!(Down_Separation >= ALIM())));
106     }
107     else
108     {
109         result = Own_Above_Threat() && (Cur_Vertical_Sep >= MINSEP) && (Up_Separation >= ALIM());
110     }
111     return result;
112 }
113
114 bool Non_Crossing_Biased_Descend()
115 {
116     int upward_preferred;
117     int upward_crossing_situation;
118     bool result;
119
120     upward_preferred = Inhibit_Biased_Climb() > Down_Separation;
121     if (upward_preferred)
122     {
123         result = Own_Below_Threat() && (Cur_Vertical_Sep >= MINSEP) && (Down_Separation >= ALIM());
124     }
125     else
126     {
127         result = !(Own_Above_Threat()) || ((Own_Above_Threat()) && (Up_Separation >= ALIM()));
128     }
129     return result;
130 }
131
132 bool Own_Below_Threat()
133 {
134     return (Own_Tracked_Alt < Other_Tracked_Alt);
135 }
136
137 bool Own_Above_Threat()
138 {
139     return (Other_Tracked_Alt < Own_Tracked_Alt);
140 }
141
142 int alt_sep_test()
```

```
143  {
144      bool enabled, tcas_equipped, intent_not_known;
145      bool need_upward_RA, need_downward_RA;
146      int alt_sep;
147
148      enabled = High_Confidence && (Own_Tracked_Alt_Rate <= OLEV) && (Cur_Vertical
     _Sep > MAXALTDIFF);
149      tcas_equipped = Other_Capability == TCAS_TA;
150      intent_not_known = Two_of_Three_Reports_Valid && Other_RAC == NO_INTENT;
151
152      alt_sep = UNRESOLVED;
153
154      if (enabled && ((tcas_equipped && intent_not_known) || !tcas_equipped))
155      {
156          need_upward_RA = Non_Crossing_Biased_Climb() && Own_Below_Threat();
157          need_downward_RA = Non_Crossing_Biased_Descend() && Own_Above_Threat();
158          if (need_upward_RA && need_downward_RA)
159          /* unreachable: requires Own_Below_Threat and Own_Above_Threat
160           to both be true – that requires Own_Tracked_Alt < Other_Tracked_Alt
161           and Other_Tracked_Alt < Own_Tracked_Alt, which isn't possible */
162              alt_sep = UNRESOLVED;
163          else if (need_upward_RA)
164              alt_sep = UPWARD_RA;
165          else if (need_downward_RA)
166              alt_sep = DOWNWARD_RA;
167          else
168              alt_sep = UNRESOLVED;
169      }
170
171      return alt_sep;
172  }
173
174  //main(argc, argv)
175  //int argc;
176  //char *argv[];
177  //{
178  void foo(int arg1, int arg2, int arg3, int arg4, int arg5, int arg6, int arg7, i
     nt arg8, int arg9
179          , int arg10, int arg11, int arg12) {
180      /*if(argc < 13)
181      {
182          //fprintf(stdout, "Error: Command line arguments are\n");
183          //fprintf(stdout, "Cur_Vertical_Sep, High_Confidence, Two_of_Three_Reports_
     Valid\n");
184          //fprintf(stdout, "Own_Tracked_Alt, Own_Tracked_Alt_Rate, Other_Tracked_Alt
     \n");
185          //fprintf(stdout, "Alt_Layer_Value, Up_Separation, Down_Separation\n");
186          //fprintf(stdout, "Other_RAC, Other_Capability, Climb_Inhibit\n");
187          exit(1);
188      }*/
189      if(arg7<0 || arg7>3) exit(1);
190      initialize();
191      Cur_Vertical_Sep = arg1;
192      High_Confidence = arg2;
193      Two_of_Three_Reports_Valid = arg3;
194      Own_Tracked_Alt = arg4;
195      Own_Tracked_Alt_Rate = arg5;
196      Other_Tracked_Alt = arg6;
197      Alt_Layer_Value = arg7;
198      Up_Separation = arg8;
199      Down_Separation = arg9;
200      Other_RAC = arg10;
201      Other_Capability = arg11;
202      Climb_Inhibit = arg12;
203
204
205
206      int ret_alt_sep_test = alt_sep_test();
207
208
209      // ********************************** //
210      assert(((((High_Confidence && (Own_Tracked_Alt_Rate <= 600) && (Cur_Vertical_
     Sep > 600))
```

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211              && (((Other_Capability == 1)
212                  && (Two_of_Three_Reports_Valid && Other_RAC == 0))
213                  || !(Other_Capability == 1))) && (Alt_Layer_Value==0) &&
214          // need_upward_RA =
215          ((ret_alt_sep_test==UPWARD_RA) &&
216          (((((Climb_Inhibit ? Up_Separation + 100 : Up_Separation) > Down_Sep
     aration)
217              && (!(Own_Tracked_Alt < Other_Tracked_Alt) || ((Own_Tracked_Alt <
     Other_Tracked_Alt)
218                  && (!((Alt_Layer_Value==0 && Down_Separation>=400)
219                  || (Alt_Layer_Value==1 && Down_Separation>=500)
220                  || (Alt_Layer_Value==2 && Down_Separation>=640)
221                  || (Alt_Layer_Value==3 && Down_Separation>=740))))))
222              ||
223              (((Climb_Inhibit ? Up_Separation + 100 : Up_Separation) > Down_Sep
     aration)
224              && ((Other_Tracked_Alt < Own_Tracked_Alt) && (Cur_Vertical_Sep >=
     300)
225                  && ((Alt_Layer_Value==0 && Up_Separation>=400)
226                  || (Alt_Layer_Value==1 && Up_Separation>=500)
227                  || (Alt_Layer_Value==2 && Up_Separation>=640)
228                  || (Alt_Layer_Value==3 && Up_Separation>=740))))
229              && (Own_Tracked_Alt < Other_Tracked_Alt)))
230
231          ||
232
233          //need_downward_RA =
234          ((ret_alt_sep_test==DOWNWARD_RA) &&
235          (((((Climb_Inhibit ? Up_Separation + 100 : Up_Separation) > Down_Sep
     aration)
236              && ((Own_Tracked_Alt < Other_Tracked_Alt) && (Cur_Vertical_Sep >=
     300)
237                  && ((Alt_Layer_Value==0 && Down_Separation>=400)
238                  || (Alt_Layer_Value==1 && Down_Separation>=500)
239                  || (Alt_Layer_Value==2 && Down_Separation>=640)
240                  || (Alt_Layer_Value==3 && Down_Separation>=740)))
241              || (((Climb_Inhibit ? Up_Separation + 100 : Up_Separation) > Down
     _Separation)
242                  && (!(Other_Tracked_Alt < Own_Tracked_Alt) || ((Other_Tracked
     _Alt < Own_Tracked_Alt)
243                  && ((Alt_Layer_Value==0 && Up_Separation>=400)
244                  || (Alt_Layer_Value==1 && Up_Separation>=500)
245                  || (Alt_Layer_Value==2 && Up_Separation>=640)
246                  || (Alt_Layer_Value==3 && Up_Separation>=740))))))
247              && (Other_Tracked_Alt < Own_Tracked_Alt))))
248          // UNRESOLVED
249          || (ret_alt_sep_test==UNRESOLVED));
250      // ********************************** //
251
252
253
254      //fprintf(stdout, "%d\n", alt_sep_test());
255      exit(0);
256  }
```