```
function [record] = main(map,person,max_iter)
% %main
% load Personputter/personsLARGE
% load Maps/Building(1exit)LARGE

%max_iter = 800;
record = recordinit(max_iter,person);


for iter=1:max_iter
    person = action(person,map);
    person = Forces(person,map);
    record = recording(person,iter,record);
    person = move(person,map);
end
end
```

```
function [record] = recordinit(max_iter,person)

l = length(person.x);
record.time_x = zeros(max_iter,l);
record.time_y = zeros(max_iter,l);
record.time_floor = zeros(max_iter,l);
record.time_force_x = zeros(max_iter,l);
record.time_force_y = zeros(max_iter,l);

end
```

```
function person = action(person,map)
%takes persons out of the map, if they reach the exit
%moves them to another floor
%actions are defined by map.action
%1 means exit
%2 means change floor (to lower floor)
new_person = person;

for i=1:length(person.x)
    x = person.x(i);
    y = person.y(i);
    if map(person.level(i)).action(y,x) == 2   %change floor (put those cells
generously around the stairs)
        ind1 = find(person.level == person.level(i)-1); %take all persons on
the lower floor
        indx = find(person.x(ind1) == person.x(i)); %take all indices with the
same x coords of ind1
        indy = find(person.y(ind1) == person.y(i)); %take all indices with the
same y coords of ind1
        ind = intersect(indx,indy); %ind gives you the index of the person on
the lower floor
        %with the same coords as the current person
        if isempty(ind)
            new_person.level(i) = person.level(i)-1; %change  floor if there
is no person blocking
        end
    end
end
```

```
function [person] = Forces(person,map)

a_map = 0.3;  %for LARGE 6, for normal 1
a_pers = .1; %force parameter , for LARGE 1.5, for normal 0.75

for i=1:length(person.x)
    floor = person.level(i);

    %force by precomputed forcefield
    person.force_x(i)=map(floor).force_x(person.y(i),person.x(i));
    person.force_y(i)=map(floor).force_y(person.y(i),person.x(i));



    %force by other persons
    for k=1:length(person.x)
        if i~=k && person.level(i)==person.level(k)  %not itself, and only
persons on the same floor
            deltax = person.x(i)-person.x(k);
            deltay = person.y(i)-person.y(k);
            dist = (deltax^2+deltay^2);
            if dist == 0
               dist = 1;
            end
            force = a_pers/dist;
            person.force_x(i) = person.force_x(i) + force*deltax/dist;
            person.force_y(i) = person.force_y(i) + force*deltay/dist;
        end
    end

end
```

```
function [record] = recording(person,iter,record)
l = length(person.x);

record.time_x(iter,1:l) = person.x;
record.time_y(iter,1:l) = person.y;
record.time_floor(iter,1:l) = person.level;
record.time_force_x(iter,1:l) = person.force_x;
record.time_force_y(iter,1:l) = person.force_y;
end
```

```
function [person]=move(person,map)
[M N] = size(map(1).wall); %every map has the same size


for i=1:length(person.x)
x_step = int32(person.force_x(i));
y_step = int32(person.force_y(i));

x_new = person.x(i) + x_step;
y_new = person.y(i) + y_step;
if x_new < N && x_new > 0 && y_new < M && y_new > 0 %making sure it is inside
the map
%making sure it isnt in the wall
x_new1 = x_new;
y_new1 = y_new;
    if map(person.level(i)).wall(y_new,x_new) > 0
       if map(person.level(i)).wall(y_new,person.x(i)) == 0
           x_new1 = person.x(i);
           y_new1 = y_new;
       elseif map(person.level(i)).wall(person.y(i),x_new) == 0
           x_new1 = x_new;
           y_new1 = person.y(i);
       end
    end

    person.x(i) = x_new1;
    person.y(i) = y_new1;
end
    %reset the forces
    person.force_x(i)=0;
    person.force_y(i)=0;

end

end
```

```
function visual(map,record,floor,nuller)
%visualizing stuff
figure(1)
set(1,'visible','off')
[M,N] = size(map(floor).wall);
x = [];
y = [];
for k=1:M
    for l=1:N
        if map(floor).wall(k,l) > 0
            x = [x,l];
            y = [y,k];
        end
    end
end
[numiter numpers] = size(record.time_x);
for n = 1:numiter
    hold on
    %scatter(x,y,10,'k')
    %scatter(x,y,10,'k','filled')
    plot(x,y,'k.')
    for m=1:numpers
        if record.time_floor(n,m) == floor
            %hold on
            %scatter(record.time_x(n,m),record.time_y(n,m),5,'r')
            plot(record.time_x(n,m),record.time_y(n,m),'r.')
        end
    end

%    xlim([0 N]);
%    ylim([0 M]);

    %pause(0.01);
    %waitforbuttonpress();
    disp(n);

    %for saving the pictures
    filename = 'C:\Users\joehla\';  %on alex' mac book pro
    nuller = '10000';  %five letters
    number = strcat(nuller(1:end-length(num2str(n))),num2str(n));
    filename = strcat(filename,number);
    saveas(gcf,filename,'jpg');

    clf(gcf);
end

hold off
end
```

```
clear all
clc

[FileName,PathName] = uigetfile('*.bmp', 'Select a Bitmap File');
I=imread(strcat(PathName,FileName));

[a b] = size(I);
for i=1:a
    for j=1:b
        if I(i,j)<50
            I(i,j)=5;
        end
        if I(i,j)>200
            I(i,j)=0;
        end
        if I(i,j)==140
            I(i,j)=2;
        end
        if I(i,j)==115
            I(i,j)=1;
        end

    end

end

% I(300,255)=2;
% I(200,150)=2;
% I(200,330)=2;

f = getFile_my(I);
[FX,FY]=computeGradientField1(f);




function [F] = getFile_my(I)
space=find(I==0);
exit=find(I==2);
passenger=find(I==1);
wall=find(I==5);
[n,m]=size(I);
F=zeros(n,m);
F(space)=1;
F(exit)=Inf;
F(passenger)=2;
F(wall)=0;
F=flipud(F);
end
```

```
%Personputter
numfloors = input('How many floors are there?');
if numfloors < 1
   error('incorrect input')
end
person.x = [];
person.y = [];
person.level = [];
person.force_x = [];
person.force_y = [];

for k=1:numfloors
selection = 'Please Select floor number: ';
disp(strcat(selection,num2str(k)));
[FileName,PathName] = uigetfile('*.bmp', 'Select the correct Bitmap File');
I=imread(strcat(PathName,FileName));

[y x] = find(I==140);    %May be changed to other value if necessary
person.x = [person.x,x'];
person.y = [person.y,y'];
person.level = [person.level,k*ones(1,length(x'))];
end
person.force_x = zeros(1,length(person.x));
person.force_y = zeros(1,length(person.x));

clear numfloors selection FileName PathName I x y k
```