

# ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ

## Τμήμα Πληροφορικής



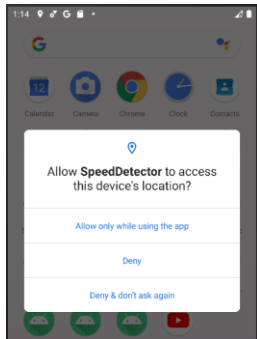
ΣΥΓΧΡΟΝΑ ΘΕΜΑΤΑ ΤΕΧΝΟΛΟΓΙΑΣ ΛΟΓΙΣΜΙΚΟΥ - ΛΟΓΙΣΜΙΚΟ ΓΙΑ  
ΚΙΝΗΤΕΣ ΣΥΣΚΕΥΕΣ

1<sup>η</sup> Ατομική Άσκηση 2021-2022

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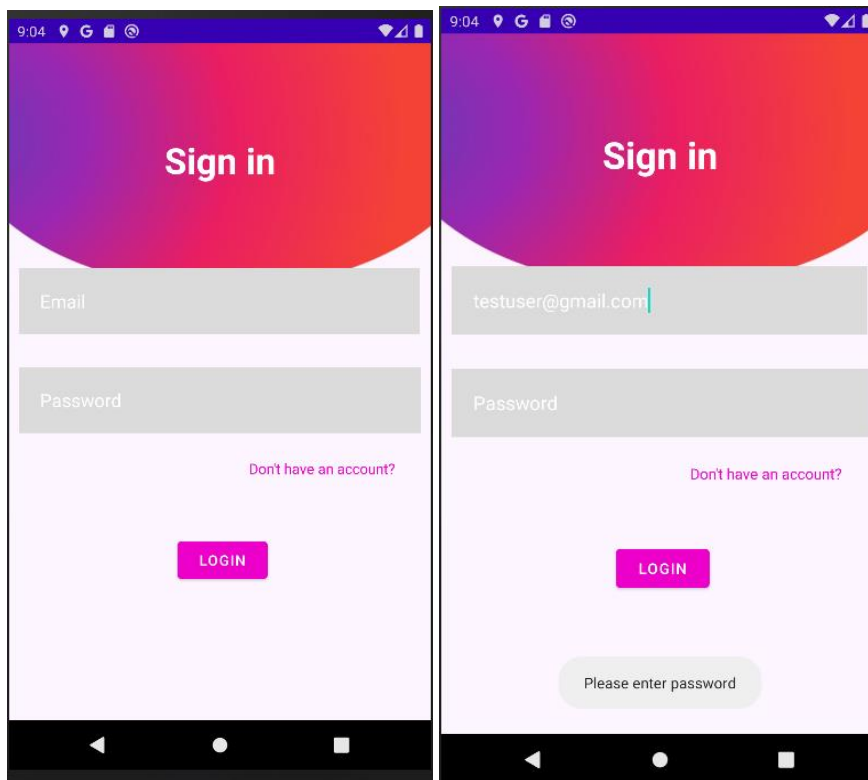
Για την εκπώνηση της εφαρμογής Speed Detector έχουν δημιουργηθεί 4 Activities(MainActivity, MapActivity, Login, Register) καθώς και οι κλάσεις Data και LocationFunctions. Για την ταυτοποίηση του χρήστη και την αποθήκευση των δεδομένων χρησιμοποιείται η firebase.

Αρχικά η εφαρμογή θα ζητήσει άδεια να λαμβάνει την τοποθεσία.



## 1. Login:

Στο login ο χρήστης συνδεέται με το email του και γίνεται έλεγχος των στοιχείων.



## Κώδικας:

```
public class Login extends AppCompatActivity {

    TextView error;
    FirebaseAuth db;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        getSupportActionBar().hide();
        setContentView(R.layout.login);

        db = FirebaseAuth.getInstance();

        //login user
        MaterialButton login = (MaterialButton) findViewById(R.id.login);
        login.setOnClickListener(view -> {
            login();
        });

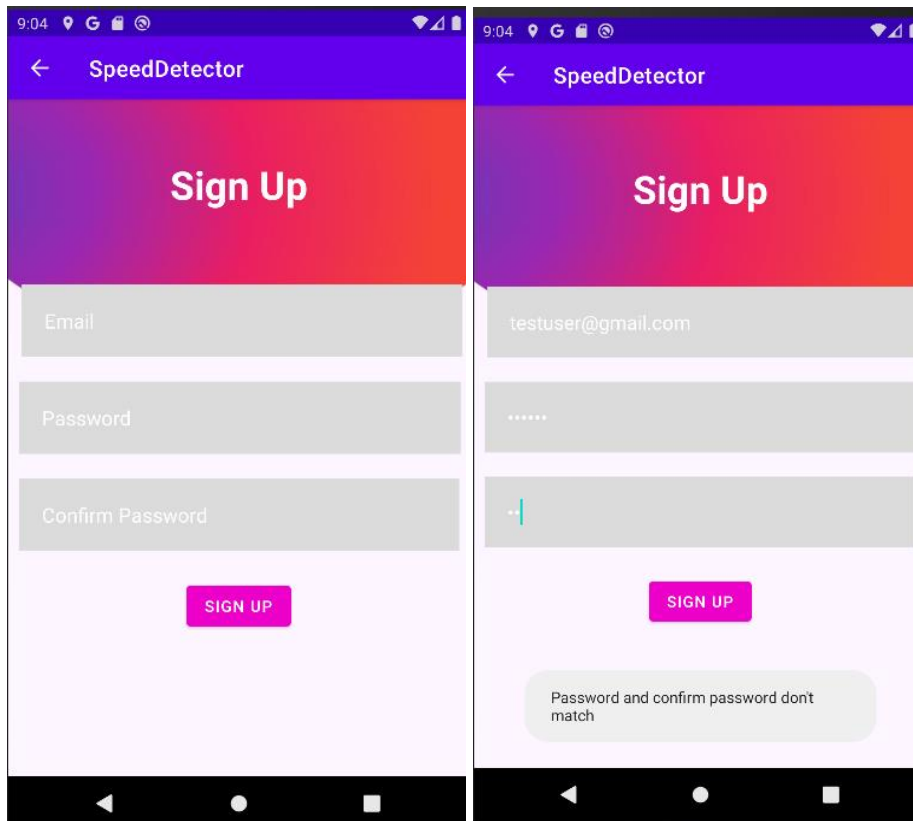
        //register user
        TextView register = findViewById(R.id.register);
        register.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) { toRegister(); }
        });
    }
}
```

Η μέθοδος `toRegister()` καλεί το Register Activity ενώ στην `onStart()` ελέγχεται αν ο χρήστης είναι συνδεδεμένος από πριν για να ανοίξει αμέσως η Main Activity.

```
57 //Login method
58 protected void login(){
59     TextView email = (TextView) findViewById(R.id.email_login);
60     TextView password= (TextView) findViewById(R.id.password);
61     error = findViewById(R.id.error);
62
63
64     if(email.getText().toString().isEmpty()){
65         Toast.makeText( context: Login.this, text: "Please enter email", Toast.LENGTH_SHORT).show();
66     }else if(password.getText().toString().isEmpty()){
67
68         Toast.makeText( context: Login.this, text: "Please enter password", Toast.LENGTH_SHORT).show();
69     }else{
70
71         db.signInWithEmailAndPassword(email.getText().toString(),password.getText().toString()).addOnCompleteListener(new OnCompleteListener<AuthResult>() {
72             @Override
73             public void onComplete(@NonNull Task<AuthResult> task) {
74                 if(task.isSuccessful()){
75
76                     SharedPreferences.Editor editor = getApplicationContext()
77                         .getSharedPreferences( name: "MyPrefs", MODE_PRIVATE).edit();
78                     editor.putString("userEmail", email.getText().toString());
79                     editor.apply();
80                     Toast.makeText( context: Login.this, text: "User logged in successfully!", Toast.LENGTH_SHORT).show();
81                     Intent intent = new Intent(getBaseContext(), MainActivity.class);
82                     startActivity(intent);
83
84                 }else{
85                     Toast.makeText( context: Login.this, text: "Wrong username or password", Toast.LENGTH_SHORT).show();
86                 }
87             }
88         });
89     }
90 }
91
92
93 //Go to registration page
94 public void toRegister(){
95     Intent intent = new Intent( packageContext: Login.this,Register.class);
96     startActivity(intent);
97 }
98 }
```

## 1. Register

Ο χρήστης κάνει εγγραφή βάζοντας email και password και γίνονται οι αναγκαίοι ελέγχοι.



Κώδικας:

Εδώ υπάρχει μόνο η **registerUser()** για την εγγραφή του χρήστη

```
20 public class Register extends AppCompatActivity {
21
22     FirebaseAuth mAuth;
23     TextView error;
24     Button singUp;
25     @Override
26     protected void onCreate(Bundle savedInstanceState) {
27         super.onCreate(savedInstanceState);
28         setContentView(R.layout.register);
29
30         getSupportActionBar().setDisplayHomeAsUpEnabled(true);
31         mAuth = FirebaseAuth.getInstance();
32         singUp = findViewById(R.id.singUp);
33         error = findViewById(R.id.error);
34
35         //register
36         singUp.setOnClickListener((view->{
37             registerUser();
38         }));
39     }
40     //registration
```

```
40 //registration
41 private void registerUser(){
42     TextView email = (TextView) findViewById(R.id.email);
43     TextView password = (TextView) findViewById(R.id.password1);
44     TextView password2 = (TextView) findViewById(R.id.password2);
45
46     if(email.getText().toString().isEmpty()){
47         Toast.makeText( context Register.this, text: "Please enter email", Toast.LENGTH_SHORT).show();
48     }
49     else if(password.getText().toString().isEmpty()){
50
51         Toast.makeText( context Register.this, text: "Please enter password", Toast.LENGTH_SHORT).show();
52     }
53     else if(!(password.getText().toString().equals(password2.getText().toString()))){
54         Toast.makeText( context Register.this, text: "Password and confirm password don't match", Toast.LENGTH_SHORT).show();
55     }
56     else{
57         mAuth.createUserWithEmailAndPassword(email.getText().toString(),password.getText().toString()).addOnCompleteListener(new OnCompleteListener<AuthResult>() {
58             @Override
59             public void onComplete(@NonNull Task<AuthResult> task) {
60                 if(task.isSuccessful()){
61                     SharedPreferences.Editor editor = getApplicationContext()
62                         .getSharedPreferences( name: "MyPrefs", MODE_PRIVATE).edit();
63                     editor.putString("userEmail", email.getText().toString());
64                     editor.apply();
65
66                     Toast.makeText( context Register.this, text: "User registered successfully!", Toast.LENGTH_SHORT).show();
67                     startActivity(new Intent( packageContext Register.this, com.example.speeddetector.Login.class));
68                 }else{
69                     Toast.makeText( context Register.this, text: "Something went wrong" , Toast.LENGTH_SHORT).show();
70                 }
71             }
72         });
73     }
74 }
75
76 }
77
78 }
```

## 2. Main Activity

Εδώ γίνεται η καταγραφή ταχύτητας καθώς και τοποθεσίας του χρήστη και ανιχνεύονται απότομες επιταχύνσεις και φρεναρίσματα. Συγκεκριμένα σε κάθε αλλαγή της τοποθεσίας η εφαρμογή συγκρίνει την διαφορά στις ταχύτητες.



User: testuser@gmail.com

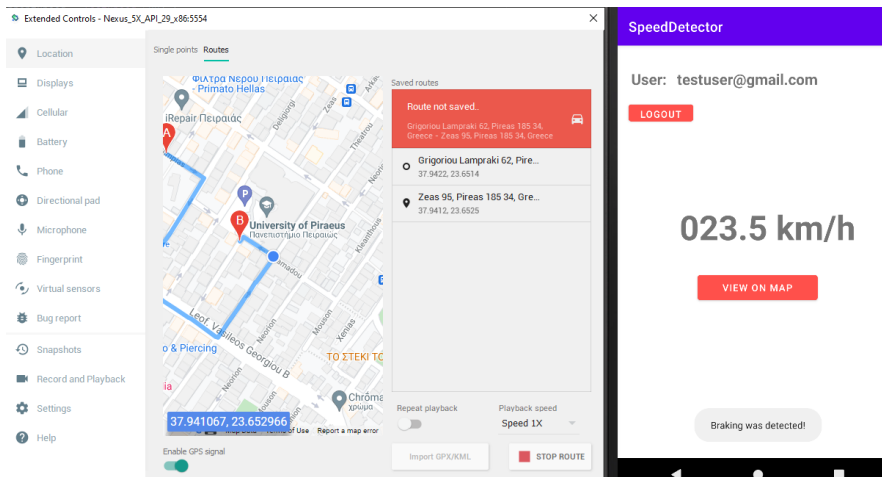
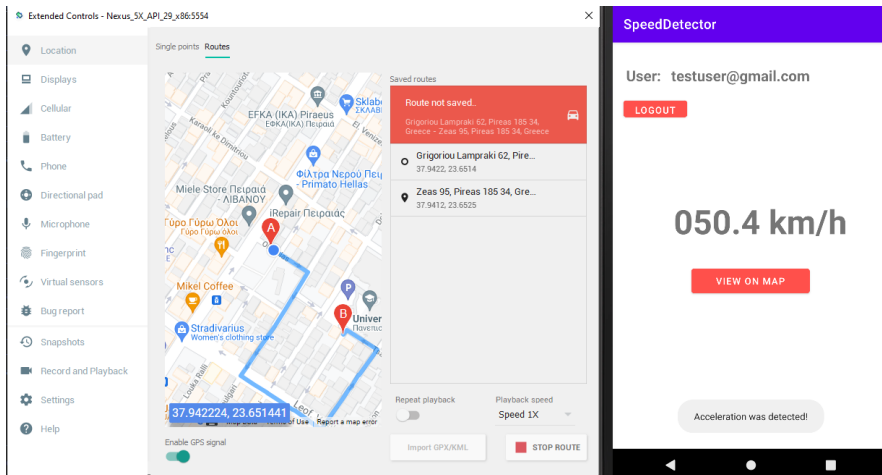
LOGOUT

000.0 km/h

VIEW ON MAP



## Κάνοντας την παρακάτω διαδρομή καταγράφηκαν μερικές απότομες επιταχύνσεις και φρεναρίσματα



```
2
  acceleration: "71.99"
  category: "acceleration"
  id: "2pEXYIU5XNNBonu3itUZ1FRUvBn1"
  lastSpeed: "71.99"
  locationX: "37.9401"
  locationY: "23.6522"
  timestamp: "2021-12-12 01:03:57.228"

3
  acceleration: "-24.48"
  category: "braking"
  id: "2pEXYIU5XNNBonu3itUZ1FRUvBn1"
  lastSpeed: "143.99"
  locationX: "37.9402"
  locationY: "23.6522"
  timestamp: "2021-12-12 01:03:58.285"
```

## Κώδικας:

```
50 protected void onCreate(Bundle savedInstanceState) {
51     super.onCreate(savedInstanceState);
52
53     setContentView(R.layout.activity_main);
54
55     mAuth = FirebaseAuth.getInstance();
56     data = new Data();
57     lastSpeed = 0;
58     tv_email = findViewById(R.id.email);
59     logout = findViewById(R.id.logout);
60     speed = findViewById(R.id.speed);
61     accelerate = findViewById(R.id.accelerate);
62     tv_email.setText(user.getEmail());
63     speed.setText(0.00 + " km/h");
64
65
66
67     SharedPreferences preferences = getSharedPreferences("MyPrefs", MODE_PRIVATE);
68
69     //Count data in firebase
70     ref.addValueEventListener(new ValueEventListener() {
71         @Override
72         public void onDataChange(@NonNull DataSnapshot snapshot) {
73             if(snapshot.exists())
74             {
75                 maxid=snapshot.getChildrenCount();
76             }
77
78             @Override
79             public void onCancelled(@NonNull DatabaseError error) {
80
81             }
82     });
```

```
84 //Logout
85 logout.setOnClickListener(view -> {
86     mAuth.signOut();
87     startActivity(new Intent( packageContext: MainActivity.this, Login.class));
88
89 });
90
91 //Open map
92 seeOnMap= findViewById(R.id.map);
93 seeOnMap.setOnClickListener(new View.OnClickListener() {
94     @Override
95     public void onClick(View view) {
96
97         startActivity((new Intent( packageContext: MainActivity.this, MapActivity.class)));
98     }
99 });
100
101 seeOnMap.setOnClickListener(view -> {
102
103     startActivity(new Intent( packageContext: MainActivity.this, MapActivity.class));
104
105 });
106 //check for GPS permission
107 if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.M && checkSelfPermission(Manifest.permission.ACCESS_FINE_LOCATION) != PackageManager.PERMISSION_GRANTED) {
108     requestPermissions(new String[]{Manifest.permission.ACCESS_FINE_LOCATION}, requestCode: 1000);
109 } else {
110     // if the permission is granted
111     doStuff();
112 }
113
114
115 this.updateSpeed( location: null);
116
117 }
```



```

23 //Every time the location is changed
24 @Override
25 public void onLocationChanged(Location location) {
26     if (location != null) {
27         locationFunctions myLocation = new locationFunctions(location);
28         this.updateSpeed(myLocation);
29     }
30 }
31 public void doStuff() {
32     LocationManager locationManager = (LocationManager) this.getSystemService(Context.LOCATION_SERVICE);
33     if (locationManager != null) {
34         if (ActivityCompat.checkSelfPermission(context: this, Manifest.permission.ACCESS_FINE_LOCATION) != PackageManager.PERMISSION_GRANTED) {
35             // TODO: Consider calling
36             // ActivityCompat#requestPermissions
37             // here to request the missing permissions, and then overriding
38             // public void onRequestPermissionsResult(int requestCode, String[] permissions,
39             // int[] grantResults)
40             // to handle the case where the user grants the permission. See the documentation
41             // for ActivityCompat#requestPermissions for more details.
42             return;
43         }
44         locationManager.requestLocationUpdates(LocationManager.GPS_PROVIDER, minTimeMs: 0, minDistanceM: 0, listener: this);
45     }
46     Toast.makeText(context: this, text: "waiting for GPS connection!", Toast.LENGTH_SHORT).show();
47 }
48 }

```

Στην `updateSpeed()` γίνεται η αναγνώριση και αποθήκευση των γεγονότων.

```

46 //We take the last speed and the current speed to find the acceleration
47 private void updateSpeed(locationFunctions location) {
48     Timestamp timestamp = new Timestamp(System.currentTimeMillis());
49     //keep the old speed
50     float nCurrentSpeed = lastSpeed;
51
52     //if location has changed
53     if (location != null) {
54         nCurrentSpeed = location.getSpeed();
55     }
56     //just for looking better
57     Formatter fmt = new Formatter(new StringBuilder());
58     fmt.format(Locale.US, format: "%5.1f", nCurrentSpeed);
59     String strCurrentSpeed = fmt.toString();
60     strCurrentSpeed = strCurrentSpeed.replace(target: " ", replacement: "0");
61
62     speed.setText(strCurrentSpeed + " km/h");
63     DecimalFormat df = new DecimalFormat(pattern: "#.0000");
64     DecimalFormat df2 = new DecimalFormat(pattern: "#.00");
65
66     //acceleration
67     if (nCurrentSpeed - lastSpeed > 20) {
68         data.setLocationX(String.valueOf(df.format(location.getLatitude())));
69         data.setLocationY(String.valueOf(df.format(location.getLongitude())));
70         data.setLastSpeed(df2.format(lastSpeed));
71         data.setAcceleration(String.valueOf(df2.format(number: nCurrentSpeed - lastSpeed)));
72         data.setTimestamp(timestamp.toString());
73         data.setCategory("acceleration");
74         data.setId(vid);
75         reff.child(String.valueOf(maxid+1)).setValue(data); //make a new child in firebase to store data
76         Toast.makeText(context: MainActivity.this, text: "Acceleration was detected!", Toast.LENGTH_SHORT).show();
77     }
78
79     //braking
80     } else if (nCurrentSpeed - lastSpeed < -20) {
81
82         data.setLocationX(String.valueOf(df.format(location.getLatitude())));
83         data.setLocationY(String.valueOf(df.format(location.getLongitude())));
84         data.setLastSpeed(df2.format(lastSpeed));
85         data.setAcceleration(String.valueOf(df2.format(number: nCurrentSpeed - lastSpeed)));
86         data.setTimestamp(timestamp.toString());
87         data.setCategory("braking");
88         data.setId(vid);

```

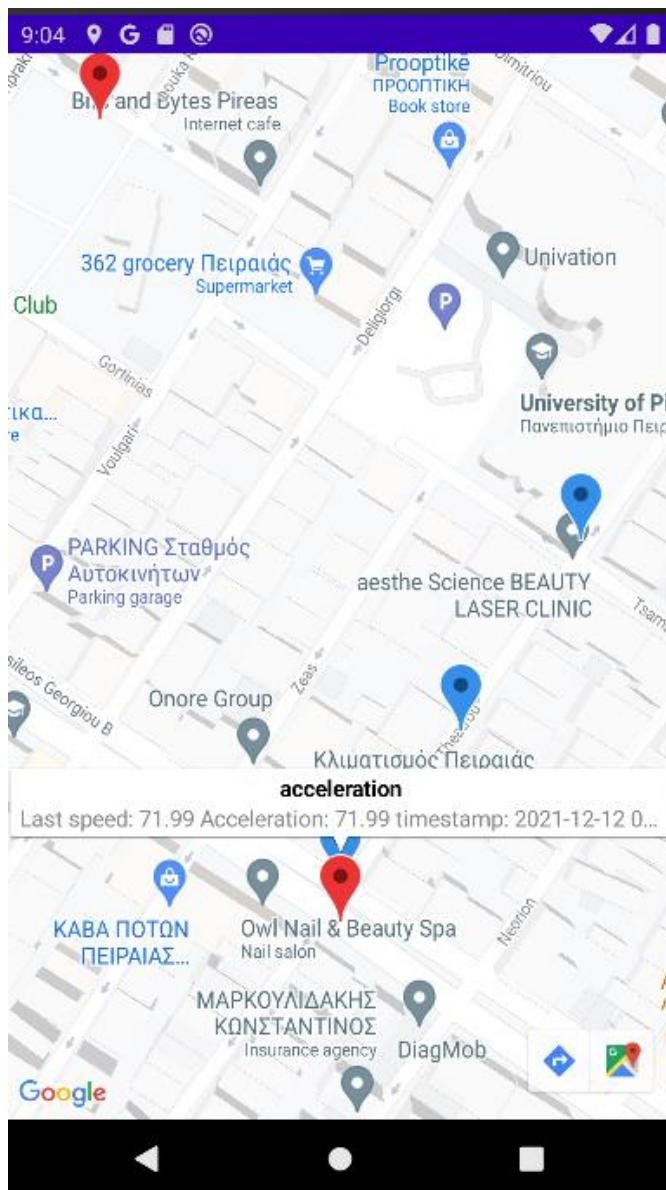
```

194         lastSpeed=nCurrentSpeed;
195     }
196
197     @SuppressWarnings("MissingSuperCall")
198     @Override
199     public void onRequestPermissionsResult(int requestCode, String[] permissions, int[] grantResults) {
200         if(requestCode == 1000){
201             if (grantResults[0] == PackageManager.PERMISSION_GRANTED) {
202                 doStuff();
203             }
204             else {
205                 finish();
206             }
207         }
208     }
209 }
210 //if the user is not logged in
211 @Override
212 protected void onStart(){
213     super.onStart();
214     FirebaseUser user = mAuth.getCurrentUser();
215     if (user == null){
216         startActivity((new Intent( packageContext: MainActivity.this, Login.class)));
217     }
218 }
219 }

```

### 3. Map Activity

Τέλος στο Map Activity ο χρήστης μπορεί να δει με κόκκινο όλες τις επιταχύνσεις και με μπλε όλα τα φρεναρίσματα που έχουν γίνει από όλους τους χρήστες. Η καταγραφή γεγονότος συνοδεύεται απο την κατηγορία της, την τελευταία ταχύτητα, την τιμή της επιτάχυνσης/επιβράδυνσης , την ώρα και ημερομηνία καθώς και το id του χρήστη.



## Κώδικας:

```
24 public class MapActivity extends FragmentActivity implements OnMapReadyCallback {
25
26     GoogleMap map;
27     long maxid=0; // number of data in firebase
28     final FirebaseDatabase database = FirebaseDatabase.getInstance();
29     DatabaseReference reff= database.getReference();
30
31     @Override
32     protected void onCreate(Bundle savedInstanceState) {
33         super.onCreate(savedInstanceState);
34         //initialize view
35         setContentView(R.layout.activity_map);
36         //initialize map fragment
37         SupportMapFragment mapfr = (SupportMapFragment) getSupportFragmentManager()
38             .findFragmentById(R.id.map);
39         mapfr.getMapAsync( callback: MapActivity.this);
40
41     }
```

Παίρνουμε το location των γεγονότων απο την βάση και δημιουργούμε markers στον χάρτη.

```
42 //when map is opened
43 @Override
44 public void onMapReady(@NonNull GoogleMap googleMap) {
45
46     Query downloadData = reff;
47
48     reff.addValueEventListener(new ValueEventListener() {
49         @Override
50         public void onDataChange(@NonNull DataSnapshot snapshot) {
51             if(snapshot.exists())
52             {
53                 maxid=snapshot.getChildrenCount();
54             }
55         }
56         @Override
57         public void onCancelled(@NonNull DatabaseError error) {
58
59         }
60     });
61     map=googleMap;
62     downloadData.addListenerForSingleValueEvent(new ValueEventListener() {
63         @Override
64         public void onDataChange(@NonNull DataSnapshot snapshot) {
65             if (snapshot.exists()) { //for all data
66                 for (DataSnapshot childDataSnapshot : snapshot.getChildren()) {
67                     //get location
68                     String locationX = childDataSnapshot.child("locationX").getValue().toString();
69                     String locationY = childDataSnapshot.child("locationY").getValue().toString();
70                     double lat = Double.parseDouble(locationX);
71                     double lon = Double.parseDouble(locationY);
72
73                     //get category
74                     String category = childDataSnapshot.child("category").getValue().toString();
75
76                     //get speed before acceleration or braking
77                     String lspeed = childDataSnapshot.child("lastSpeed").getValue().toString();
78
79                     //get acceleration or braking
80                     String acceleration = childDataSnapshot.child("acceleration").getValue().toString();
81
82                     //get timestamp
83                     String timestamp = childDataSnapshot.child("timestamp").getValue().toString();
84
85                     //get user
```

```

84         String user = childDataSnapshot.child("id").getValue().toString();
85
86
87         LatLng name;
88         name = new LatLng(lat, lon);
89         DecimalFormat df2 = new DecimalFormat( pattern: "#.00");
90         //acceleration
91         if(category.equals("acceleration")){
92             map.addMarker(new MarkerOptions()
93                 .position(name)
94                 .title(category)
95                 .snippet("Last speed: "+lspeed+" Acceleration: "+acceleration + " timestamp: "+timestamp+ " user: "+user )
96                 .icon(BitmapDescriptorFactory.defaultMarker(BitmapDescriptorFactory.HUE_RED)));
97             map.animateCamera(CameraUpdateFactory.newLatLngZoom(name, zoom: 15f));
98         }else{
99             //braking
100             map.addMarker(new MarkerOptions()
101                 .position(name)
102                 .title(category)
103                 .snippet("Last speed: "+lspeed+" Braking: "+ acceleration + "timestamp: "+timestamp+ "user: "+user)
104                 .icon(BitmapDescriptorFactory.defaultMarker(BitmapDescriptorFactory.HUE_AZURE)));
105             map.animateCamera(CameraUpdateFactory.newLatLngZoom(name, zoom: 15f));
106         }
107     }
108 }
109
110
111 @Override
112 public void onCancelled (@NonNull DatabaseError error){
113
114 }

```