**CLAIMS**

1. A method of determining a safe speed for a train comprising:

determining a current location of the train on a railway;

determining a detection range of a sensor system of the train based on the current location of the train and a data store comprising information from which the detection range at a plurality of locations on the railway can be determined; and

determining a safe speed for the train based on the detection range;

wherein the data store is a digital map comprising information relating to a geometry of the railway tracks including track slope and track curvature;

wherein determining the detection range of the train comprises performing a calculation in real time to determine the detection range based on the geometry of the railway tracks in upcoming sections of the railway along a route of the train ahead of the current location of the train;

wherein the calculation comprises:

determining whether the upcoming sections include a curved or sloped section;

setting the detection range as a first predetermined distance X in response to determining that the upcoming sections do not include a curved or sloped section;

calculating the detection range based at least in part on a radius of the curved section in response to determining the upcoming sections include a curved section; and

calculating the detection range based at least in part on a gradient of the slope in response to determining the upcoming sections include a sloped section.

2. The method of claim 1, wherein determining the safe speed comprises determining a first speed at which a braking distance of the train is within the detection range and setting said first speed as the safe speed.

3. The method of claim 1 or 2, further comprising at least one of: displaying the safe speed, generating an alert if a current speed of the train is greater than the safe speed or adjusting a current speed of the train if the current speed is greater than the safe speed.

4. The method of any one of the preceding claims, wherein calculating the detection range includes smoothing the variation of detection range so that the detection range decreases gradually from the first predetermined distance X to a second distance Y and gradually increases from the second distance Y to the first predetermined distance X, wherein X is a detection range for a flat, straight section of railway track and Y is a minimum detection range in relation to a curved or sloped section of the railway track.

5. The method of claim 4, comprising gradually decreasing the detection range from X to Y at locations approaching the start of the curved section and gradually increasing the detection range from Y to X at locations approaching the end of the curved section; wherein Y is a minimum detection range for the curved section.

6. The method of claim 4, wherein the minimum detection range Y is applied at locations between a first distance Z and a second distance W ahead of a junction between two portions of the sloped section having different gradients, Z and W being calculated based on characteristics of the sloped section.

7. The method of any one of the preceding claims, comprising the sensor system identifying an obstacle on the rail track ahead of the train and determining the safe speed of the train based on the detected obstacle.

8. The method of any one of the preceding claims, wherein the sensor system comprises a camera and Laser Detecting and Ranging (LiDAR) apparatus and wherein determining the location of the train comprises identifying a location on the digital map having features which match features detected by the camera and LiDAR apparatus.

9. An on-board system for a train comprising:

a sensor system for detecting objects on a railway track ahead of the train;

a locating system for determining a current location of the train;

a data store comprising information from which detection ranges of the sensor system at a plurality of locations on the railway can be determined; and

a speed determining module configured to:

receive a current location of the train from the locating system;

determine a detection range of the sensor system based on the current location of the train and the information in the data store; and

determine a safe speed for the train based on the determined detection range of the sensor system;

wherein the data store is a digital map comprising information relating to a geometry of the railway tracks including track slope and track curvature;

wherein, for determining the detection range of the train, the speed determining module is configured to perform a calculation in real time to determine the detection range based on the geometry of the railway tracks in upcoming sections of the railway along a route of the train ahead of the current location of the train;

wherein, for performing the calculation, the speed determining module is configured to:

determine whether the upcoming sections include a curved or sloped section;

set the detection range as a first predetermined distance X in response to determining that the upcoming sections do not include a curved or sloped section;

calculate the detection range based at least in part on a radius of the curved section in response to determining the upcoming sections include a curved section; and

calculate the detection range based at least in part on a gradient of the slope in response to determining the upcoming sections include a sloped section.

10. The on-board system of claim 9, wherein the on-board system is configured to perform the method of any one of claims 2-8.

11. The on-board system of claim 9 or 10, wherein the sensor system comprises a camera and a Laser Detection and Ranging (LiDAR) apparatus and the locating system is configured to determine a location of the train by comparing landmarks in a digital map with landmarks detected by the camera and LiDAR apparatus.

12. The on-board system of claim 9 or 10, wherein the on-board system comprises:

a camera for generating a video stream comprising a plurality of 2D images;

a visual analytics module for detecting objects in the 2D images of the video stream;

a LiDAR apparatus for generating a 3D point cloud;

an integration module for integrating data from the visual analytics module with data from the point cloud generated by the LiDAR apparatus to form a digital model of an environment of the train; and

wherein the locating system is configured to match the digital model with a location on the digital map.