To solve the localization problem in an unknown environment, where the robot needs to determine its position without prior knowledge of the map, a common approach is to use **Simultaneous Localization and Mapping (SLAM)** techniques.
SLAM is a method that allows a robot to create a map of its environment while also tracking its own location within that map. This is achieved by fusing data from various sensors to estimate both the robot's pose (position and orientation) and the map of the environment.

For this problem, if you don't know the map and need to localize the robot, the following sensors and algorithms might be used:

Sensors:

Lidar (Light Detection and Ranging): Lidar sensors emit laser beams and measure the time it takes for the beams to reflect off objects and return. This data can be used to create a 2D or 3D map of the surroundings and identify obstacles.

Visual Cameras: Cameras can capture images of the environment, which can be processed using computer vision techniques to extract features, identify landmarks, and estimate the robot's position.

IMU (Inertial Measurement Unit): IMUs provide information about the robot's orientation, acceleration, and angular velocity. This data can be fused with other sensor data to improve pose estimation.

Wheel Encoders: If the robot's movement is along the floor, wheel encoders can measure the distance the wheels have turned, aiding in dead reckoning.

Algorithms:

Extended Kalman Filter (EKF): The EKF is a popular algorithm for fusing sensor data to estimate the robot's pose and map in real-time. It's commonly used in SLAM applications.

Particle Filter: Particle filters use a probabilistic approach to represent the robot's belief about its position and environment. They can handle nonlinearities and uncertainties well, making them suitable for SLAM.

Graph-Based SLAM: This approach formulates the problem as a graph, where nodes represent robot poses and map features, and edges represent sensor measurements. Graph optimization algorithms like Gauss-Newton or Levenberg-Marquardt are used to minimize the error between predicted and measured values.

Visual SLAM: When using cameras as sensors, visual SLAM methods extract features from camera images, track these features across frames, and estimate the robot's pose and the map by triangulating these features.