SmartBinSimulator Class Documentation

Description:

The `SmartBinSimulator` class simulates data generation for a single smart dustbin. It's designed to be decoupled and usable in various projects for testing or simulation, generating data points similar to real smart bin sensor data.

Parameters (init):

- `bin_id` (str): A unique identifier for the bin (e.g., "MEL-CBD-001").
- `latitude` (float): The bin's geographical latitude.
- `longitude` (float): The bin's geographical longitude.
- `initial_fill_level` (float, optional): The starting fill level percentage (0.0 to 100.0), defaulting to 0.0.
- `fill_rate_per_hour` (float, optional): Average fill rate increase per hour (percentage points), defaulting to 1.0.
- `update_interval_seconds` (int, optional): Time interval (seconds) between data point generation, defaulting to 60.
- `initial_status` (str, optional): The bin's initial operational status, defaulting to "online".
- `initial_temperature_celsius` (float, optional): The bin's initial temperature (Celsius), defaulting to 20.0.
- `fill_variation_percentage` (float, optional): Maximum random percentage points to vary fill level per interval, defaulting to 0.5.
- `temp_variation_celsius` (float, optional): Maximum random Celsius degrees to vary temperature per interval, defaulting to 0.2.

Fields (Attributes):

- `_bin_id` (str): Stores the bin's unique identifier.
- `_latitude` (float): Stores the bin's latitude.
- `_longitude` (float): Stores the bin's longitude.
- `_fill_level` (float): Stores the current fill level percentage.
- `_fill_rate_per_second` (float): Stores the fill rate per second (calculated from `fill_rate_per_hour`).
- `_update_interval_seconds` (int): Stores the update interval in seconds.
- `_status` (str): Stores the bin's current status.
- `_temperature_celsius` (float): Stores the bin's current temperature.
- `_fill_variation_percentage` (float): Stores the fill variation percentage.
- `_temp_variation_celsius` (float): Stores the temperature variation value.
- `_last_update_time` (datetime): Stores the last update time as a datetime object.

Methods:

- `generate_data_point(self) -> dict`: Generates a simulated data point for the bin, including fill level and temperature, with random variations.
- `get_bin_id(self) -> str`: Returns the bin's unique identifier.
- `get_location(self) -> tuple[float, float]`: Returns the bin's location as a tuple (latitude, longitude).
- `get_current_fill_level(self) -> float`: Returns the current fill level percentage.
- `get_status(self) -> str`: Returns the bin's current status.
- `set_status(self, status: str)`: Sets the bin's status to a new value.