Algorithm 3: Raspberry Pi Sensor Data Accumulation, Uploading to ThingSpeak Channel and Control Action Determination

Inputs: Filtered sensor values from Arduino Nano and Arduino Mega;
Outputs: Control actions sent to Arduino Mega and sensor data sent to ThingSpeak channel;
Initialize: All required packages and libraries;
Declare: Pins and variables for all sensors;
Declare: Boolean variables *pHCheck* and *ECCheck* as True;
Declare: Variables *pHInterval* and *ECInterval* with values 1200;
Declare: Variables *LightSwitchOnTime* and *LightSwitchOffTime* with values 64800 and 21600 respectively;
Declare: Boolean variable *LightSwitchDay* as True;
Declare: ThingSpeak Channel ID and Write Key for sensor data upload;
Set: Duration for grow lights ON (18 hours) and OFF (6 hours);
while *True* **do**
    Assign USB ports for Arduino Mega and Nano;
    Read sensor data from Arduino Mega and Arduino Nano;
    Send sensor data to ThingSpeak channel;
    for *pH* **do**
        while *not* *pHCheck* **do**
            Wait for *pHInterval* seconds;
            Set *pHCheck* as True;
        if *pHCheck* **then**
            if $pH \leq 6.5$ **then**
                Send control action to turn on Acid Doser pump;
            else if $pH \geq 5.5$ **then**
                Send control action to turn on Base Doser pump;
            Set *pHCheck* as False;
    for *EC* **do**
        while *not* *ECCheck* **do**
            Wait for *ECInterval* seconds;
            Set *ECCheck* as True;
        if *ECCheck* **then**
            if $EC \leq 6.5$ **then**
                Send control action to turn on Acid Doser pump;
            else if $EC \geq 5.5$ **then**
                Send control action to turn on Base Doser pump;
            Set *ECCheck* as False;
    if *Water Temperature* ≥ 18 **then**
        Send control action to turn Water Chiller ON;
    else if *Water Temperature* < 16 **then**
        Send control action to turn Water Chiller OFF;
    if *Air Temperature* ≥ 20 **then**
        Send control action to turn Air Chiller ON;
    else if *Air Temperature* < 16 **then**
        Send control action to turn Air Chiller OFF;
    if *LightSwitchDay* **then**
        if *Current time* $-$ *LightSwitchOnTime* $\geq$ *Duration* **then**
            Set *LightSwitchDay* as False;
            Send control action to turn grow lights ON;
    else
        if *Current time* $-$ *LightSwitchOffTime* $\geq$ *Duration* **then**
            Set *LightSwitchDay* as True;
            Send control action to turn grow lights OFF;