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// pid.cpp: Source file for pid and all of it's assets
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#include "../include/pid.hpp"

int sgn(float __x);

namespace pid {
    float Kp          = 0.8;
    float Ki          = 0.04;
    float Kd          = 0.35;
    unsigned int deadband = 10;

    bool enabled[2]    = {true, true};
    unsigned int default_precision = 30;
    TaskHandle pidHandle;

    void controller(void* none) {
        float current[2];
        float error[2];
        float lastError[2] = {0, 0};
        float integral[2] = {0, 0};
        float derivative[2];
        float power[2];

        sensors::left.reset();
        sensors::right.reset();
        sensors::quad_t* sides[2] = {&sensors::left, &sensors::right};

        while (true) {
            printf("| %ld | %ld |\n", sensors::left.value(), sensors::right.value());
            for (size_t i = 0; i < 2; i++) {
                if (enabled[i]) {

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        current[i] = sides[i]->value();
        error[i] = sides[i]->request - current[i];
        if ((unsigned int)abs((int)error[i]) <= deadband) {
            continue;
        }
        integral[i] = (Ki != 0 && abs((int)error[i]) < INTEGRAL_LIMIT)
            ? (integral[i] + error[i])
            : 0;
        derivative[i] = error[i] - lastError[i];
        lastError[i] = error[i];
        power[i] =
            (Kp * error[i]) + (Ki * integral[i]) + (Kd * derivative[i]);
        power[i] = (power[i] <= DRIVE_MIN)
            ? DRIVE_MIN
            : ((power[i] >= DRIVE_MAX) ? DRIVE_MAX : power[i]);
        power[i] *= 8.1f / powerLevelMain();
        (i == 0) ? drive::left.set(power[i]) : drive::right.set(power[i]);
    }
}
delay(25);
}
free(none);
}

void enable(void) {
    enabled[0] = true;
    enabled[1] = true;
}

void disable(void) {
    enabled[0] = false;
    enabled[1] = false;
}

void init(void) {
    pidHandle = taskCreate(controller, TASK_DEFAULT_STACK_SIZE, NULL,
        TASK_PRIORITY_DEFAULT);
}

void stop(void) { taskSuspend(pidHandle); }

void go(void) { taskResume(pidHandle); }

void request(long l, long r) {
    sensors::left.request = l;
    sensors::right.request = r;
}

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}

void wait(unsigned long precision, unsigned long blockTime) {
    if (blockTime > 0) {
        auto start = millis();
        while ((sensors::left.value() > sensors::left.request + precision ||
                 sensors::left.value() < sensors::left.request - precision ||
                 sensors::right.value() > sensors::right.request + precision ||
                 sensors::right.value() < sensors::right.request - precision) &&
                millis() - start <= blockTime) {
            delay(50);
        }
    } else {
        while ((sensors::left.value() > sensors::left.request + precision ||
                 sensors::left.value() < sensors::left.request - precision ||
                 sensors::right.value() > sensors::right.request + precision ||
                 sensors::right.value() < sensors::right.request - precision)) {
            delay(50);
        }
    }
}

int sgn(float __x) {
    if (__x > 0)
        return 1;
    if (__x < 0)
        return -1;
    return 0;
} // namespace pid

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