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/**
 * @file auto.c
 * @brief The primary source for the autonomous operation period
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 *
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 */

#include "../include/auto.h"

bool isAuto = true;

void autonLeft12();
void autonLeft22();
void autonRight12();
void autonRight22();
void autonSkills();
void autonTest();

void autonNone() {}

void testMotors();

void autonRehuh();

int    selectedAuton      = 6;
Auton autons[MAX_AUTON + 1] =
{ {
    // index 0
    .name      = "left 12",
    .sensorName = "arm",
    .sensor     = &arm.sensor,
    .execute    = &autonLeft12,
}, {
    // index 1

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        .name      = "left 22",
        .sensorName = "gyr2",
        .sensor     = &gyro.child,
        .execute    = &autonLeft22,
    },{
        // index 2
        .name      = "right 12",
        .sensorName = "claw",
        .sensor     = &claw.sensor,
        .execute    = &autonRight12,
    },{
        // index 3
        .name      = "right 22",
        .sensorName = "mgo",
        .sensor     = &mgo.sensor,
        .execute    = &autonRight22,
    },{
        // index 4
        .name      = "skills",
        .sensorName = "snc",
        .sensor     = &sonic,
        .execute    = &autonSkills,
    },{
        // index 5
        .name      = "none",
        .sensorName = "arm",
        .sensor     = &arm.sensor,
        .execute    = &autonNone,
    },{
        // index 6
        .name      = "test",
        .sensorName = "lef",
        .sensor     = &drive[0].sensor,
        .execute    = &autonTest,
    },{
        // index 7
        .name      = "test motors",
        .sensorName = "rit",
        .sensor     = &drive[1].sensor,
        .execute    = &testMotors,
    }, };

void armToPosition(float pos, unsigned long until) {
    armSettings.target = pos;
    until              += millis();
}

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        do {
            PID(&armSettings);
            motorUpdate(&arm);
            sensorRefresh(arm.sensor);
            delay(10);
        } while (!armSettings.isTargetReached && millis() < until);
    } /* armToPosition */

    void driveToPosition(int l, int r, unsigned long until) {
        driveSettings[0].target = l;
        driveSettings[1].target = r;
        until += millis();

        do {
            PID(&driveSettings[0]);
            PID(&driveSettings[1]);

            motorUpdate(&arm);
            sensorRefresh(arm.sensor);
            sensorRefresh(&gyro);

            for (int i = 0; i < 2; i++) {
                motorUpdate(&drive[i]);
                sensorRefresh(drive[i].sensor);
            }

            delay(10);
        } while ((!driveSettings[0].isTargetReached ||
            !driveSettings[1].isTargetReached) &&
            millis() < until);

        drive[0].power = 0;
        drive[1].power = 0;
        update();
    } /* driveToPosition */

    void driveToPositionAngle(int l, int r, int a, unsigned long until) {
        int gError;
        driveSettings[0].target = l;
        driveSettings[1].target = r;
        until += millis();

        do {
            gError = (a - gyro.average) * 1.5;
            PID(&driveSettings[0]);
            PID(&driveSettings[1]);

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        drive[0].power += gError;
        drive[1].power -= gError;

        motorUpdate(&arm);
        sensorRefresh(arm.sensor);
        sensorRefresh(&gyro);

        for (int i = 0; i < 2; i++) {
            motorUpdate(&drive[i]);
            sensorRefresh(drive[i].sensor);
        }

        delay(10);
    } while ((!driveSettings[0].isTargetReached ||
            !driveSettings[1].isTargetReached) &&
            millis() < until);

    drive[0].power = 0;
    drive[1].power = 0;
    update();
} /* driveToPosition */

void mogoP(int p) {
    mutexGive(mogo._mutex);
    mutexGive(mogo.child->_mutex);
    mutexGive(mogo.sensor->_mutex);
    mutexGive(mogo.sensor->child->_mutex);
    int pow;

    do {
        pow = sgn(p - mogo.sensor->average);
        sensorRefresh(mogo.sensor);
        mogo.power = (pow ? pow : 1) * 127;
        motorUpdate(&mogo);
        delay(10);
    } while ((isAutonomous() || !isAuto) && abs(p - mogo.sensor->average) > 78);

    mogo.power = 0;
    motorUpdate(&mogo);
} /* mogoP */

Task mogoPT(void *p) {
    mogoP((int)p);
} /* mogoPT */

float gyroPIDC[3] = {

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        5.279,
        0.0,
        1.953,
    };

    void gyroPID(int target, int precision) {
        int error      = 0;
        int integral    = 0;
        int derivative = 0;

        do {
            derivative = (target - gyro.average) - error;
            error      = target - gyro.average;
            integral   += error / 10;

            drive[0].power = -((error * gyroPIDC[0]) +
                               (integral * gyroPIDC[1]) +
                               (derivative * gyroPIDC[2]));
            drive[1].power = ((error * gyroPIDC[0]) +
                               (integral * gyroPIDC[1]) +
                               (derivative * gyroPIDC[2]));

            if (lcdReadButtons(uart1)) {
                gyroPIDC[0] += 0.005;
                delay(100);
            }
            info();
            printf("%f\n", gyroPIDC[0]);
            lcdPrint(uart1, 1, "%f", ((float)(powerLevelMain())) / 1000.0);
            lcdPrint(uart1, 2, "%f", gyroPIDC[0]);
            update();
            delay(10);
        } while (true || abs(error) > precision ||
                 integral > 10);

        drive[0].power = 0;
        drive[1].power = 0;
    } /* gyroPID */

    void turnTo(int angle, unsigned long until) {
        until += millis();

        gyroSettings[0].target = angle;
        gyroSettings[1].target = angle;

        do {

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        PID(&gyroSettings[0]);
        PID(&gyroSettings[1]);

        update();
        delay(10);
    } while ((!gyroSettings[0].isTargetReached ||
        !gyroSettings[1].isTargetReached) &&
        millis() < until);

    driveSet(0, 0);
} /* turnTo */

void getMogo() {
    claw.power = -25;
    armSettings.target = ARM_QUARTER + 20;
    arm.power = -70;
    motorUpdate(&arm);
    delay(300);
    driveSet(25, 25);

    TaskHandle armHandle = GO(armPID, NULL);
    TaskHandle mogoHandle = GO(mogoPT, MOGO_DOWN + 10);
    delay(600);

    driveToPosition(2075, 2075, 2300);
    driveSet(15, 15);

    while (taskGetState(mogoHandle))
        delay(10);

    mogoHandle = GO(mogoPT, MOGO_UP);

    driveSet(127, 127);
    delay(260);

    driveSet(18, 18);

    while (mogo.sensor->average > MOGO_MID) {
        sensorRefresh(mogo.sensor);
        delay(10);
    }

    if (taskGetState(armHandle))
        taskDelete(armHandle);
    driveSet(0, 0);
    mogo.power = 6;
}

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        motorUpdate(&mogo);
    } /* getMogo */

Task backUp(void *time) {
    unsigned long t = (unsigned long)time;

    while (millis() - t < 14250) {
        delay(10);
    }

    t = millis();

    while (isAutonomous() && millis() - t < 500) {
        driveSet(-127, -127);
        update();
        delay(10);
    }
} /* backUp */

void placeCone() {
    // Arm down
    armToPosition(ARM_DOWN + 35, 400);

    // Drop cone
    claw.power = 127; // Open claw
    motorUpdate(&claw);
    delay(475); // Give claw time to open
    claw.power = 0; // Stop claw
    armToPosition(ARM_QUARTER, 400);
    arm.power = 10; // Keep arm up
    motorUpdate(&arm);
    print("Cone placed!\n"); // Notify computer of cone state
    delay(150);
} /* placeCone */

Task placeConeT(void *none) {
    placeCone();
} /* placeCone */

TaskHandle dropMogo20(TaskHandle mogoHandle) {
    int p[2] = { drive[0].sensor->value, drive[1].sensor->value };

    // Start the mogo intake down
    if (!mogoHandle && taskGetState(mogoHandle))
        mogoHandle = GO(mogoPT, MOGO_MID + 125);
    driveToPosition(p[0] + 250, p[1] + 250, 600);
}

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driveSet(30, 30);

// Wait until the mogo intake is up
while (taskGetState(mogoHandle)) {
    delay(10);
}

// Wait a bit for the mobile goal to settle
mogo.power = 127;
motorUpdate(&mogo);
driveSet(-64, -64);
delay(315);
mogo.power = 30;

driveToPosition(p[0] - 400, p[1] - 400, 3000);
return GO(mogoPT, MOGO_UP);
} /* dropMogo */

void autonomous() {
    unsigned long startTime = millis();
    isAuto = true;
    reset();
    sensorReset(drive[0].sensor);
    sensorReset(drive[1].sensor);
    sensorReset(arm.sensor);
    sensorReset(mogo.sensor);
    sensorReset(&gyro);

    selectedAuton = clipNum(selectedAuton, MAX_AUTON - 1, 0);
    if (autons[selectedAuton].execute != NULL)
        autons[selectedAuton].execute();

    armSettings.target = arm.sensor->average; // Reset the arm position to it's
                                              // current position

    printf("\n\n\rFinished autonomous in %ldms\n\n", millis() - startTime);
    while (isAutonomous()) {
        PID(&armSettings); // Hold the arm position
        update();
        delay(10);
    }
} /* autonomous */

void testMotors() {
    while (isAutonomous()) {
        for (int i = 1; i <= 10; i++) {

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        motorSet(i, 127);
        delay(250);
        motorStopAll();
    }
}
} /* testMotors */

Task driveToPositionAngleT(void *triple) {
    Triple *t = (Triple *)triple;

    driveSettings[0].target = t->a;
    driveSettings[1].target = t->b;

    do {
        PID(&driveSettings[0]);
        PID(&driveSettings[1]);
        drive[0].power += (t->c - gyro.average) * 2.3;
        drive[1].power -= (t->c - gyro.average) * 2.3;

        motorUpdate(&arm);
        sensorRefresh(arm.sensor);
        sensorRefresh(&gyro);

        for (int i = 0; i < 2; i++) {
            motorUpdate(&drive[i]);
            sensorRefresh(drive[i].sensor);
        }

        delay(10);
    } while ((!driveSettings[0].isTargetReached ||
        !driveSettings[1].isTargetReached));

    drive[0].power = 0;
    drive[1].power = 0;
    delete(triple);
    taskDelete(NULL);
} /* driveToPositionAngleT */

Task armToPositionT(void *pos) {
    int p = (int)pos;

    armToPosition(p, p * 1.34);
    taskDelete(NULL);
} /* armToPositionT */

Task clawToPositionT(void *pos) {

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        clawSettings.target = (int)pos;

        do {
            PID(&clawSettings);
            motorUpdate(&claw);
            sensorRefresh(claw.sensor);
            delay(10);
        } while (!clawSettings.isTargetReached);

        taskDelete(NULL);
    } /* clawToPositionT */

    Task die(void *none) {
        taskDelete(NULL);
    }

    void moveTo(int leftV, int rightV, int armV, int mogoV, int clawV, int gyroV) {
        TaskHandle driveHandle, armHandle, mogoHandle, clawHandle;
        update();

        if ((abs(leftV - drive[0].sensor->value) > driveSettings[0].tolerance) ||
            (abs(rightV - drive[1].sensor->value) > driveSettings[1].tolerance) ||
            (abs(gyroV - gyro.average) > gyroSettings[0].tolerance)) {
            Triple *t = new(Triple);
            t->a      = leftV;
            t->b      = rightV;
            t->c      = gyroV;
            driveHandle = GO(driveToPositionAngleT, t);
        }

        if (abs(armV - arm.sensor->value) > armSettings.tolerance)
            armHandle = GO(armToPositionT, armV);

        if (abs(mogoV - mogo.sensor->average) > 90)
            mogoHandle = GO(mogoPT, mogoV);

        if (abs(clawV - claw.sensor->value) > clawSettings.tolerance)
            clawHandle = GO(clawToPositionT, clawV);

        if (driveHandle)
            while (taskGetState(driveHandle))
                delay(10);

        if (armHandle)
            while (taskGetState(armHandle))
                delay(10);
    }

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        if (mogoHandle)
            while (taskGetState(mogoHandle))
                delay(10);

        if (clawHandle)
            while (taskGetState(clawHandle))
                delay(10);
    } /* moveTo */

    void armPID(void *none) {
        while (isEnabled()) {
            PID(&armSettings);
            delay(10);
        }
    }
}

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