```c
/**
 * @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 autonLeft28();
void autonRight12();
void autonRight22();
void autonSkills();
void autonTest();
void autonStack();

void autonNone() {}

void testMotors();

void autonRehuh();

int   selectedAuton         = 1;
Auton autons[MAX_AUTON + 1] =
{ {
                // index 0
                .name       = "left 12",
                .sensorName = "arm",
                .sensor     = &arm.sensor,
                .execute    = &autonLeft12,
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},{
        // index 1
        .name       = "left 22",
        .sensorName = "gyr2",
        .sensor     = &gyro.child,
        .execute    = &autonLeft22,
},{
        // index 2
        .name       = "left 28",
        .sensorName = "gyr2",
        .sensor     = &gyro.child,
        .execute    = &autonLeft28,
},{
        // index 3
        .name       = "right 12",
        .sensorName = "claw",
        .sensor     = &claw.sensor,
        .execute    = &autonRight12,
},{
        // index 4
        .name       = "right 22",
        .sensorName = "mgo",
        .sensor     = &mogo.sensor,
        .execute    = &autonRight22,
},{
        // index 5
        .name       = "skills",
        .sensorName = "snc",
        .sensor     = &sonic,
        .execute    = &autonSkills,
},{
        // index 6
        .name       = "none",
        .sensorName = "arm",
        .sensor     = &arm.sensor,
        .execute    = &autonNone,
},{
        // index 7
        .name       = "test",
        .sensorName = "lef",
        .sensor     = &drive[0].sensor,
        .execute    = &autonTest,
},{
        // index 8
        .name       = "test motors",
        .sensorName = "rit",
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                .sensor     = &drive[1].sensor,
                .execute    = &testMotors,
        },{
                // index 9
                .name       = "stack",
                .sensorName = "claw",
                .sensor     = &claw.sensor,
                .execute    = &autonStack,
        }, };

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

        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;
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        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.averageVal) * 1.5;
                PID(&driveSettings[0]);
                PID(&driveSettings[1]);
                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);
        int pow;

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

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

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

float gyroPIDC[3] = {
        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.averageVal) - error;
                error      = target - gyro.averageVal;
                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();
                #ifdef DEBUG_MODE
                        printf("%f\n", gyroPIDC[0]);
                #endif
                lcdPrint(uart1, 1, "%f", ((float)(powerLevelMain())) / 1000.0);
                lcdPrint(uart1, 2, "%f", gyroPIDC[0]);
                update();
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                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 {
                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         = -10;
        armSettings.target = ARM_QUARTER + 20;
        delay(210);
        driveSet(25, 25);

        TaskHandle armHandle = GO(armPID, NULL);
        TaskHandle mogoHandle = GO(mogoPT, MOGO_DOWN + 10);
        delay(450);

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

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

        mogoHandle = GO(mogoPT, MOGO_UP);

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

        driveSet(18, 18);

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

        if (taskGetState(armHandle))
                taskDelete(armHandle);
        driveSet(0, 0);
        mogo.power = 6;
        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
        clawSettings.target = CLAW_OPEN;
        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);
        #ifdef DEBUG_MODE
                print("Cone placed!\n"); // Notify computer of cone state
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        #endif
        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 claw down
        if (!mogoHandle && taskGetState(mogoHandle))
                mogoHandle = GO(mogoPT, MOGO_MID + 125);
        driveToPosition(p[0] + 250, p[1] + 250, 600);
        driveSet(30, 30);

        // Wait until the mogo claw 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);

        TaskHandle armHandle = GO(armPID, NULL);
        selectedAuton = clipNum(selectedAuton, MAX_AUTON, 0);
        if (autons[selectedAuton].execute != NULL)
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                autons[selectedAuton].execute();

        armSettings.target = arm.sensor->averageVal; // Set target to current pos
        taskDelete(armHandle);

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

void testMotors() {
        while (isAutonomous()) {
                for (int i = 1; i <= 10; i++) {
                        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.averageVal) * 2.3;
                drive[1].power -= (t->c - gyro.averageVal) * 2.3;

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

                for (int i = 0; i < 2; i++) {
                        motorUpdate(&drive[i]);
                        sensorRefresh(drive[i].sensor);
                }
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                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) {
        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.averageVal) > gyroSettings[0].tolerance)) {
                Triple *t = new(Triple);
                t->a        = leftV;
                t->b        = rightV;
                t->c        = gyroV;
                driveHandle = GO(driveToPositionAngleT, t);
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        }

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

        if (abs(mogoV - mogo.sensor->averageVal) > 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);

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

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

void armPID(void *none) {
        while (isEnabled()) {
                PID(&armSettings);
                PID(&clawSettings);

                motorUpdate(&arm);
                motorUpdate(&claw);
                sensorRefresh(arm.sensor);
                sensorRefresh(claw.sensor);
                delay(10);
        }
}
```