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/**
 * @file sensors.c
 * @brief Implementation of hardware abstraction for sensors
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 *
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 */

#include "../include/sensors.h"
#include <math.h>

float defaultRecalc(int n) {
    return n;
} /* defaultRecalc */

int readSensorValue(Sensor *s) {
    switch (s->_type) {
        case Digital:
            return digitalRead(s->port);

        case Analog:
            return (s->calibrate) ?
                analogReadCalibrated(s->port) :
                analogRead(s->port);

        case AnalogHR:
            return analogReadCalibratedHR(s->port);

        case Sonic:
            return ultrasonicGet(s->_pros);

        case Quad:
            return encoderGet(s->_pros);

        case Gyroscope:

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        return gyroGet(s->_pros);

        default:
            return 0;
    } /* switch */
} /* readValue */

void sensorRefresh(Sensor *s) {
    if (!s) {
        return;
    }

    if (s->child) {
        sensorRefresh(s->child);
    }

    if (!mutexTake(s->_mutex, 5)) {
        #ifdef DEBUG_MODE
            print("= Cannot take mutex =");
        #endif
        return;
    }

    int val = (s->_type == Digital) ? readSensorValue(s) :
        (readSensorValue(s) - s->zero);

    if (s->inverted) {
        if (s->_type == Digital) {
            val = !val;
        } else {
            val = -val;
        }
    }

    if (s->recalc) {
        val = round(s->recalc(val));
    }

    s->value = val;
    s->average = s->child ? ((s->value + s->child->average) / 2) : s->value;

    mutexGive(s->_mutex);
} /* sensorRefresh */

void sensorReset(Sensor *s) {
    if (s->child) {

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        sensorReset(s->child);
    }

    switch (s->_type) {
        case Gyroscope:
            gyroReset(s->_pros);
            s->zero = 0;
            break;

        case Quad:
            encoderReset(s->_pros);
            s->zero = 0;
            break;

        default:
            s->zero = readSensorValue(s);
            break;
    } /* switch */
} /* sensorReset */

Sensor newSensor(SensorType    type,
                 unsigned char  port,
                 bool           inverted,
                 unsigned short  calibrate) {
    if (port < 1) {
        port = 1;
    }

    Sensor s = {
        ._type      = type,
        .recalc     = &defaultRecalc,
        .port       = port,
        .inverted   = inverted,
        .calibrate  = calibrate,
        ._mutex     = mutexCreate(),
    };

    switch (type) {
        case Digital:
            pinMode(port, INPUT);
            break;

        case Analog:

            if (calibrate) {
                analogCalibrate(port);
            }
    }
}

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        }
        break;

    case AnalogHR:
        analogCalibrate(port);
        break;

    case Sonic:
        s._pros = ultrasonicInit(port, (char)calibrate);
        break;

    case Quad:
        s._pros = encoderInit(port, (char)calibrate, false);
        break;

    case Gyroscope:
        s._pros = gyroInit(port, calibrate);
        break;

    default:
        break;
} /* switch */

sensorReset(&s);
return s;
} /* newsensor */

Sensor newDigital(unsigned char port, bool inverted) {
    return newSensor(Digital, port, inverted, false);
} /* newDigital */

Sensor newSonic(unsigned char orange, unsigned char yellow) {
    return newSensor(Sonic, orange, false, yellow);
} /* newSonic */

Sensor newQuad(unsigned char top, unsigned char bottom, bool inverted) {
    return newSensor(Quad, top, inverted, bottom);
} /* newQuad */

Sensor newAnalog(unsigned char port, bool calibrate) {
    return newSensor(Analog, port, false, calibrate);
} /* newAnalog */

Sensor newAnalogHR(unsigned char port) {
    return newSensor(AnalogHR, port, false, true);
} /* newAnalogHR */

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Sensor newGyro(unsigned char port, bool inverted, int calibration) {  
    return newSensor(Gyroscope, port, inverted, calibration);  
} /* newGyro */
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