

Lego® Egglift

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Acknowledgment:

- The original [Egglift](#) idea is from famous French inventor [Roland Moreno](#)
- The black-and-white wheel light sensor is an original idea from Benjamin Erwin in his excellent book "[Creative Projects with Lego® Mindstorms™](#)".
- Thanks to [Richard "Vauban"](#) for his help and advices.

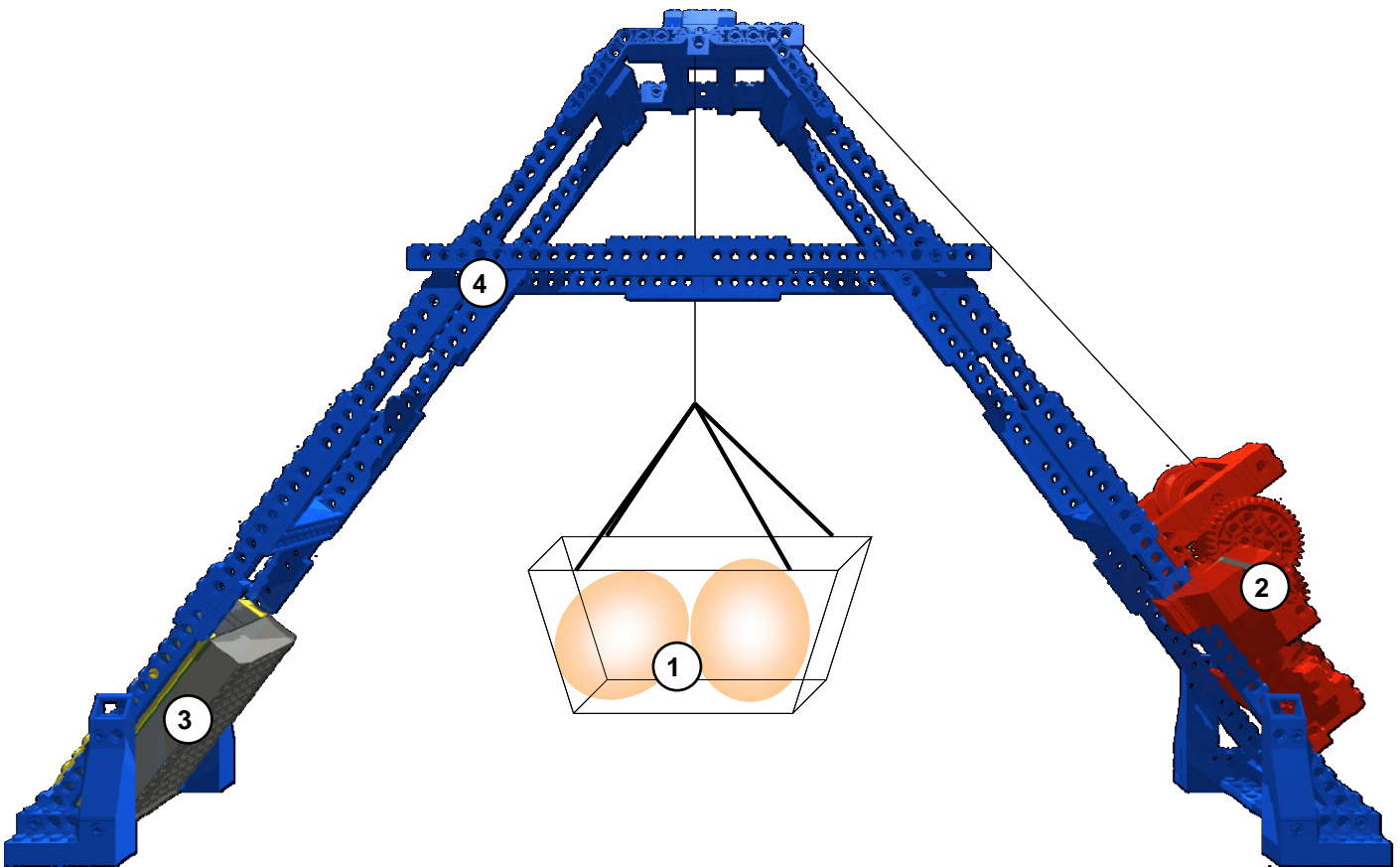
Introduction:

The Egglift is an appliance to cook boiled eggs.

Description:

The Egglift is mainly composed of four elements:

1. A metallic perforated non-Lego® basket where you lay the eggs. The basket, made of metallic wires, is fairly small and can contain 2 eggs maximum.
2. A winch that contain a motor to pull up or down the basket through a string and also a light sensor to detect the position of the basket. (in red)
3. A Lego® RCX to pilot the basket through the winch and a 180 seconds temporization (adjustable). (in yellow-grey)
4. Finally, a Lego® structure where the three above elements are graft. (in blue)



Instructions of operation:

- Fill up a pan with water, and place over a cook top.
- Place the Egglift (with its basket in up position) above the pan, in a way that when the basket is in down position, it fully goes in the pan.
- Place one or two eggs into the basket.
- Turn on the cook top.
- Push the button “Run” of the RCX.

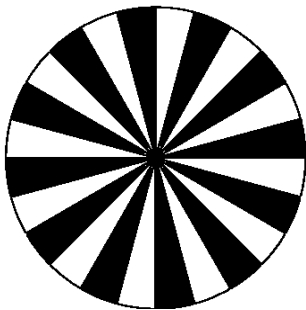
That’s all for the human operations: the Egglift will automatically detect when the water reached its boiling point. The basket will then automatically drop down until it is fully submerged in the boiling water. After three minutes, the basket is automatically pulled up and an alarm rings, warning you the boiled eggs are ready. Just pick them up and enjoy!

Detecting the position of the basket:

To obtain a reliable cooking system, it is relatively important the lower (and less importantly the upper) position of the basket remains constant and precise: the eggs have to be fully submerged in the boiling water for a safe cooking.

The choice of a temporization in the program (turn on the winch for 5 seconds before turning it off) would have not been well suited for this application.

Because of inaccuracies in the motor, in the gear train and the weight variation of the eggs, to basket would have not returned to the same place every time.



Black-and-white wheel if printed
will fit over a 40-tooth wheel

The position of the basket can be detected with a light sensor aimed at the black-and-white circle on the left stuck to a 40-tooth wheel.

This wheel has 24 divisions, alternatively black-and-white. When the motor that control the basket is on, the light sensor counts how many divisions had passed by, thus letting know the RCX a fairly accurate representation of the position of the basket.

This method is not too accurate, but it is accurate enough for this type of application.

Detecting when the water reached its boiling point:

A Lego® temperature sensor (ref# 9755) is connected to the RCX. The drawback of this sensor is its range: it only works at temperatures between -20°C and 70°C (-4°F to 158°F). That's a long way from the water boiling point 100°C.



Thus, the Lego® temperature sensor had to be relocated to a spot where it reach its maximum range (approximately 70°C) when at the same time, the water reach 100°C.

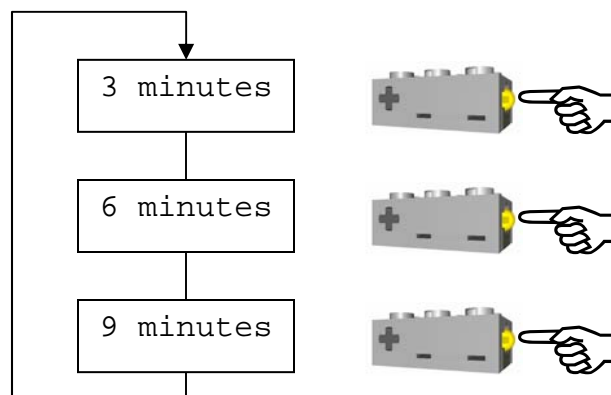
Typically, it is approximately one Inch (35mm) above the water level.

The use of a [DCP Microdevelopments®](#) ProTemp sensor (ref# D10047) dipped inside the pan would most likely get round this major drawback.

Cooking time selection:

Even if Egglift's primary function is to cook boiled eggs, it can also cook soft-boiled and hard-boiled eggs!

Actually, a cooking time selection button is conveniently placed next to the RCX. Each press on the button selects cooking times.



<humor>

Estimated cost:

If the Egglift had to be mass product (I'm still looking forward any potential investors who might be interested for a joint venture), its production costs would be roughly \$ 190.00 USD. (This is only including raw materials and not including assembly costs).



This is very competitive compared to other Steam Egg Cooker on the market which retail for around \$ 25.00 USD.

The Egglift is more aimed at wealthy “*connoisseur*” customers who want to cook their boiled eggs “à *l’ancienne*” but with a touch of modernity.

Advantage of the Egglift:

The Egglift features countless advantages over other competitor steam egg cooker:

- It is cheap.
- It is compact.
- It is convenient.
- It can be conveniently stored.
- It can cook eggs in large quantity (two at a time) for large family.
- It is dishwasher safe (*after removal of the RCX, the motor and the sensors*).
- It will not break up the look of most “*gourmet*” kitchen.

</humor>

```

/*
Egglift Program
(c) November 2004 by Chris Caron
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Special thanks to Richard "Vauban53" Olivero for his precious help:
I wasn't able to finish this program if it wasn't for him.
He can be reached at: r.olivero at wanadoo dot fr
*/

#define COOKING_TIME    18000           // Define cooking time for the eggs
#define BOILING_TEMP    699           // Define boiling temperature to 70 o C
#define BASKET_HEIGHT   14            // Define travelling height of the basket
#define BLACK_STRIP     42            // Define the black strips from 0 to 41
#define WHITE_STRIP     43            // Define the white strips from 42 to 100

int COOK_TIME;                       // Variable Cooking Time
int COOK_TYPE;                       // Variable Cooking Type
int counter;                          // Variable Compteur

task main ()
{
    SetSensor (SENSOR_1, SENSOR_CELSIUS); // Sensor 1 is a temperature sensor
    SetSensor (SENSOR_2, SENSOR_LIGHT);   // Sensor 2 is a light sensor
    SetSensor (SENSOR_3, SENSOR_TOUCH);   // Sensor 3 is a touch sensor
    SetPower (OUT_A, 4);                  // Set speed of Output A at 4
    counter = 0;                          // Set the counter at 0
    COOK_TYPE = 1;

    while (SENSOR_1 =< BOILING_TEMP)     // While Sensor1 reached boiling time
    {
        if (SENSOR_3 == 1)               // If sensor1 is pressed
        {
            SetUserDisplay(COOK_TYPE, 0); // Display value of variable COOK_TYPE
            COOK_TYPE += 1;                // Add 1 to the variable COOK_TYPE
            if (COOK_TYPE > 3)
            {
                COOK_TYPE = 1;
            }
        }
    }

    switch(COOK_TIME)
    {
        case 1:
            if (COOK_TYPE == 1)
            {
                COOK_TIME == 18000;      // Boiled Egg at 3 minutes
            }
            break;
        case 2:
            if (COOK_TYPE == 2)
            {
                COOK_TIME == 36000;      // Soft-Boiled Egg at 6 minutes
            }
            break;
        default:
            if (COOK_TYPE == 3)
            {
                COOK_TIME == 54000;      // Hard-Boiled Egg at 9 minutes
            }
            break;
    }

    OnRev (OUT_A);                       // Lower the basket
    start counting;                       // Start the task "counting"

    while (counter < BASKET_HEIGHT)      // Wait until basket is in lower position
    {
        Wait (1);                        // Just to add a command
    }
}

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    }

    Off (OUT_A);           // Stop the descent of the basket
    counter = 0 ;         // Set the counter at 0
    Wait (COOKING_TIME); // Wait until the eggs are cooked
    SetPower (OUT_A,OUT_FULL); // Set power of OutputA ar full
    OnFwd (OUT_A);       // Rise back the basket

    while (counter < BASKET_HEIGHT) // Wait until basket is in upper position
    {
        Wait (10); // Just to add a command
    }

    Off (OUT_A); // Stop the basket
    PlaySound (4); // Play an alarm
    counter = 0 ; // Set the counter at 0
    StopAllTasks (); // Stop all running tasks
}

task counting() // Task "counting"
{
    while(true)
    {
        if (SENSOR_2 > BLACK_STRIP)
        {
            counter += 1; // Add 1 to the counter...
            while(SENSOR_2 > BLACK_STRIP) // ...while Sensor2 detect black strip
            {
            }
        }
        else
        {
            counter +=1; // Add 1 to the counter...
            while(SENSOR_2 < WHITE_STRIP) // ...while Sensor2 detect white strip
            {
            }
        }
    }
}
}

```

Lego(r) Egglift
Parts Estimated Cost

Winch, RCX and Superstructure:

| Nb. | Color | Ref # | Description | Unit Cost | Total Cost |
|------------|------------|--------------|--|-----------|------------------|
| 2 | Black | 3956.DAT | Bracket 2 x 2 - 2 x 2 | \$ 0.06 | \$ 0.12 |
| 10 | Black | 3004.DAT | Brick 1 x 2 | \$ 0.02 | \$ 0.20 |
| 3 | Black | 3010.DAT | Brick 1 x 4 | \$ 0.02 | \$ 0.06 |
| 6 | Black | 3002.DAT | Brick 2 x 3 | \$ 0.02 | \$ 0.12 |
| 1 | Black | 3001.DAT | Brick 2 x 4 | \$ 0.04 | \$ 0.04 |
| 4 | Black | 5306.DAT | Electric Brick 2 x 2 x 2/3 with Wire End | \$ 7.00 | \$ 28.00 |
| 1 | Blue | 2982C01.DAT | Electric Light Sensor | \$ 20.00 | \$ 20.00 |
| 1 | Yellow | 9755 | Temperature Sensor | \$ 20.00 | \$ 20.00 |
| 1 | Light-Gray | 9757.DAT | Touch Sensor | \$ 10.00 | \$ 10.00 |
| 1 | Black | 884.DAT | Electric Mindstorms RCX | \$ 90.00 | \$ 90.00 |
| 1 | Light-Gray | 71427C01.DAT | Electric Technic Mini-Motor 9v | \$ 20.00 | \$ 20.00 |
| 11 | Light-Gray | 3023.DAT | Plate 1 x 2 | \$ 0.02 | \$ 0.22 |
| 4 | Light-Gray | 32028.DAT | Plate 1 x 2 with Door Rail | \$ 0.02 | \$ 0.08 |
| 4 | Light-Gray | 3710.DAT | Plate 1 x 4 | \$ 0.02 | \$ 0.08 |
| 1 | Black | 3710.DAT | Plate 1 x 4 | \$ 0.02 | \$ 0.02 |
| 2 | Light-Gray | 3666.DAT | Plate 1 x 6 | \$ 0.03 | \$ 0.06 |
| 8 | Light-Gray | 3460.DAT | Plate 1 x 8 | \$ 0.03 | \$ 0.24 |
| 1 | Black | 3460.DAT | Plate 1 x 8 | \$ 0.03 | \$ 0.03 |
| 6 | Light-Gray | 4477.DAT | Plate 1 x 10 | \$ 0.06 | \$ 0.36 |
| 2 | Light-Gray | 3022.DAT | Plate 2 x 2 | \$ 0.01 | \$ 0.02 |
| 4 | Light-Gray | 2420.DAT | Plate 2 x 2 Corner | \$ 0.02 | \$ 0.08 |
| 1 | Light-Gray | 2817.DAT | Plate 2 x 2 with Holes | \$ 0.02 | \$ 0.02 |
| 2 | Light-Gray | 3021.DAT | Plate 2 x 3 | \$ 0.02 | \$ 0.04 |
| 2 | Black | 3020.DAT | Plate 2 x 4 | \$ 0.02 | \$ 0.04 |
| 7 | Light-Gray | 3795.DAT | Plate 2 x 6 | \$ 0.02 | \$ 0.14 |
| 1 | Black | 3034.DAT | Plate 2 x 8 | \$ 0.04 | \$ 0.04 |
| 9 | Light-Gray | 3832.DAT | Plate 2 x 10 | \$ 0.04 | \$ 0.36 |
| 1 | Black | 2445.DAT | Plate 2 x 12 | \$ 0.05 | \$ 0.05 |
| 2 | Black | 3035.DAT | Plate 4 x 8 | \$ 0.12 | \$ 0.24 |
| 1 | Black | 3747.DAT | Slope Brick 33 3 x 2 Inverted | \$ 0.03 | \$ 0.03 |
| 4 | Black | 3040B.DAT | Slope Brick 45 2 x 1 | \$ 0.03 | \$ 0.12 |
| 1 | Black | 3039.DAT | Slope Brick 45 2 x 2 | \$ 0.03 | \$ 0.03 |
| 2 | Black | 3684.DAT | Slope Brick 75 2 x 2 x 3 | \$ 0.03 | \$ 0.06 |
| 4 | Black | 3705.DAT | Technic Axle 4 | \$ 0.04 | \$ 0.16 |
| 1 | Black | 3706.DAT | Technic Axle 6 | \$ 0.04 | \$ 0.04 |
| 1 | Black | 3707.DAT | Technic Axle 8 | \$ 0.04 | \$ 0.04 |
| 1 | Light-Gray | 6538A.DAT | Technic Axle Joiner | \$ 0.02 | \$ 0.02 |
| 8 | Light-Gray | 3749.DAT | Technic Axle Pin | \$ 0.01 | \$ 0.08 |
| 5 | Black | 3700.DAT | Technic Brick 1 x 2 with Hole | \$ 0.01 | \$ 0.05 |
| 2 | Black | 32000.DAT | Technic Brick 1 x 2 with Holes | \$ 0.01 | \$ 0.02 |
| 4 | Black | 3894.DAT | Technic Brick 1 x 6 with Holes | \$ 0.01 | \$ 0.04 |
| 2 | Black | 3702.DAT | Technic Brick 1 x 8 with Holes | \$ 0.01 | \$ 0.02 |
| 2 | Red | 3702.DAT | Technic Brick 1 x 8 with Holes | \$ 0.01 | \$ 0.02 |
| 4 | Black | 2730.DAT | Technic Brick 1 x 10 with Holes | \$ 0.01 | \$ 0.04 |
| 2 | Black | 3895.DAT | Technic Brick 1 x 12 with Holes | \$ 0.02 | \$ 0.04 |
| 8 | Black | 3703.DAT | Technic Brick 1 x 16 with Holes | \$ 0.02 | \$ 0.16 |
| 7 | Light-Gray | 3713.DAT | Technic Bush | \$ 0.02 | \$ 0.14 |
| 5 | Light-Gray | 4265C.DAT | Technic Bush 1/2 Smooth | \$ 0.02 | \$ 0.10 |
| 1 | Light-Gray | 3647.DAT | Technic Gear 8 Tooth | \$ 0.20 | \$ 0.20 |
| 2 | Light-Gray | 3648.DAT | Technic Gear 24 Tooth | \$ 0.20 | \$ 0.40 |
| 2 | Light-Gray | 3649.DAT | Technic Gear 40 Tooth | \$ 0.20 | \$ 0.40 |
| 1 | Yellow | 6588.DAT | Technic Gearbox 2 x 4 x 3 & 1/3 | \$ 0.60 | \$ 0.60 |
| 4 | Black | 6629.DAT | Technic Liftarm 1 x 9 Bent | \$ 0.05 | \$ 0.20 |
| 4 | Dark-Gray | 32002.DAT | Technic Pin 3/4 | \$ 0.01 | \$ 0.04 |
| 1 | Black | 6558.DAT | Technic Pin Long with Friction | \$ 0.01 | \$ 0.01 |
| 6 | Black | 4459.DAT | Technic Pin with Friction | \$ 0.01 | \$ 0.06 |
| 28 | Black | 2780.DAT | Technic Pin with Friction and Slots | \$ 0.01 | \$ 0.28 |
| 3 | Light-Gray | 3709B.DAT | Technic Plate 2 x 4 with Holes | \$ 0.05 | \$ 0.15 |
| 1 | Light-Gray | 32001.DAT | Technic Plate 2 x 6 with Holes | \$ 0.05 | \$ 0.05 |
| 1 | Light-Gray | 3738.DAT | Technic Plate 2 x 8 with Holes | \$ 0.05 | \$ 0.05 |
| 1 | Black | 4716.DAT | Technic Worm Screw | \$ 0.25 | \$ 0.25 |
| 2 | Light-Gray | 2432.DAT | Tile 1 x 2 with Handle | \$ 0.03 | \$ 0.06 |
| 1 | Black | 2431.DAT | Tile 1 x 4 | \$ 0.06 | \$ 0.06 |
| 1 | Yellow | 6580.DAT | Wheel 43.2 x 28 Balloon Small | \$ 0.10 | \$ 0.10 |
| 222 | | | | | \$ 194.78 |

Basket:

| Nb. | Color | Ref # | Description | Unit Cost | Total Cost |
|----------|-------|-------|---------------------------|-----------|----------------|
| 1 | N/A | N/A | Metalic perforated basket | \$ 2.00 | \$ 2.00 |
| 1 | N/A | N/A | Mini metallic chain | \$ 1.00 | \$ 1.00 |
| 1 | | | | | \$ 3.00 |

Remote Control (optional):

| Nb. | Color | Ref # | Description | Unit Cost | Total Cost |
|----------|-------|-------|-------------------------|-----------|-----------------|
| 1 | Black | 9738 | RCX Remote Control Unit | \$ 15.00 | \$ 15.00 |
| 1 | | | | | \$ 15.00 |