

Scratch Car Race Part 4 – Making Two Tyre Skidding

In Part 4 of the Car Race Game, we go back and revisit the skidding of the car, and change it from a single skid to a true two wheel double skid.

Rename the existing skid sprite to now be called “Left Skid”.

Create a new variable called “skidDir” and set it as “For this sprite only”. This variable will be used to set the angle direction for the skid sprite.

Remove some of the blue block code and replace it with the following code.

LeftSkid
x: -256 y: -173 direction: -91

Scripts | **Costumes** | **Sounds**

when clicked

hide

pen up

clear

set pen color to black

set pen size to 3

forever

set skidDir to direction of Car - 150

if Speed of Car > 7

pen down

wait 0.1 secs

broadcast Max Speed Exceeded

else

if Speed of Car < -7

pen down

wait 0.1 secs

broadcast Reverse Speed Exceeded

else

pen up

pen up

go to x: x position of Car + sin of skidDir * 15 y: y position of Car + cos of skidDir * 15

This script code leaves a single black skid mark on the track for the LEFT TYRE whenever the car's maximum speed is exceeded.

The slowing down of the car is done by the actual car sprite. The "Skid" sprite passes messages from here that the Car can receive.

We need to consider positive speed when the up arrow is pressed and the car is moving forward, as well as negative speed. Negative speed happens when the car is being reversed.

The variable "skidDir" is for the direction of the skid.

We found the value that works best is to set the skid direction to direction of car - 150. If we change this to -90, skid is outside car, if we make it -180 skid is too close towards middle of car.

Direction = angle car is going at compared to a vertical line going straight up to the top of the stage screen.

FORWARD DIRECTIONS:

Direction of zero for an object is straight up vertically.

Down the screen towards bottom is 180.

To the Right is 90 degrees, Left is -90 degrees.

REVERSE DIRECTIONS:

90 = backwards to left, -90 backwards to right, 180 = straight up, 0 = straight down.

Rather than have the skid sprite constantly point at 180 degrees to the car direction, we set it to be -150 degrees so it goes out from the car at an angle.

In Trigonometry, the "Sin" and "Cos" values are the same for all four directions the car can be going in: Up, Down, Left, Right. Eg. It does not matter if the angle is negative 30 or positive 30, the size of the trig values will be the same. Trig values are related to angles.

The (x,y) coordinates of the car are in the middle of the car, and so to move our left skid mark out from the center to the left, we add onto the x and y coordinates of the car's middle position, using Sin and Cos Trig functions. We make these values the skid's x and y coordinates at all times in the Forever loop.

Because trig function values are decimals less than zero, we need to multiply by a number value that will move the skid a certain distance that is > 1 unit. By trail and error, we found out that "15" puts the skid in a good position. .

This Skid code sets up the Skidding for when we exceed the maximum speed.

Skidding for the space bar applying the brakes is set up separately, later in this document.

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To make the skid sprite for the Right Tyre, simply right click the Left Tyre skid, and click “Duplicate”.

The only code needing changing is the code for “set SkidDir” to be + 150 instead of -150.

RightSkid
x: -256 y: -173 direction: -91

Scripts | **Costumes** | **Sounds**

when clicked

- hide
- pen up
- clear
- set pen color to black
- set pen size to 3

forever

- set skidDir to direction of Car + 150
- if Speed of Car > 7
 - pen down
 - wait 0.1 secs
 - broadcast Max Speed Exceeded
- else
 - if Speed of Car < -7
 - pen down
 - wait 0.1 secs
 - broadcast Reverse Speed Exceeded
 - else
 - pen up
- pen up
- go to x: x position of Car + sin of skidDir * 15 y: y position of Car + cos of skidDir * 15

Callout Boxes:

- This script code leaves a single black skid mark on the track for the RIGHT TYRE whenever the car's maximum speed is exceeded.
- The slowing down of the car is done by the actual car sprite. The "Skid" sprite passes messages from here that the Car can receive.
- We need to consider positive speed when the up arrow is pressed and the car is moving forward, as well as negative speed. Negative speed happens when the car is being reversed.
- The variable "skidDir" is for the direction of the skid.
- We found the value that works best is to set the skid direction to direction of car + 150. If we change this to +90, skid is outside car, if we make it +180 skid is too close towards middle of car.
- Direction = angle car is going at compared to a vertical line going straight up to the top of the stage screen.
- FORWARD DIRECTIONS:**
Direction of zero for an object is straight up vertically.
Down the screen towards bottom is 180.
To the Right is 90 degrees, Left is -90 degrees.
- REVERSE DIRECTIONS:**
90 = backwards to left, -90 backwards to right, 180 = straight up, 0 = straight down.
- Rather than have the skid sprite constantly point at 180 degrees to the car direction, we set it to be +150 degrees so it goes out from the car at an angle.
- In Trigonometry, the "Sin" and "Cos" values are the same for all four directions the car can be going in: Up, Down, Left, Right. Eg. It does not matter if the angle is negative 30 or positive 30, the size of the trig values will be the same. Trig values are related to angles.
- The (x,y) coordinates of the car are in the middle of the car, and so to move our left skid mark out from the center to the left, we add onto the x and y coordinates of the car's middle position, using Sin and Cos Trig functions. We make these values the skid's x and y coordinates at all times in the Forever loop.
- Because trig function values are decimals less than zero, we need to multiply by a number value that will move the skid a certain distance that is > 1 unit. By trail and error, we found out that "15" puts the skid in a good position.

Making the long block is quite tricky, and requires several green blocks stacked inside each other: an Add block, a Multiply block, and a Function block. Click right on the edge to move the whole group.

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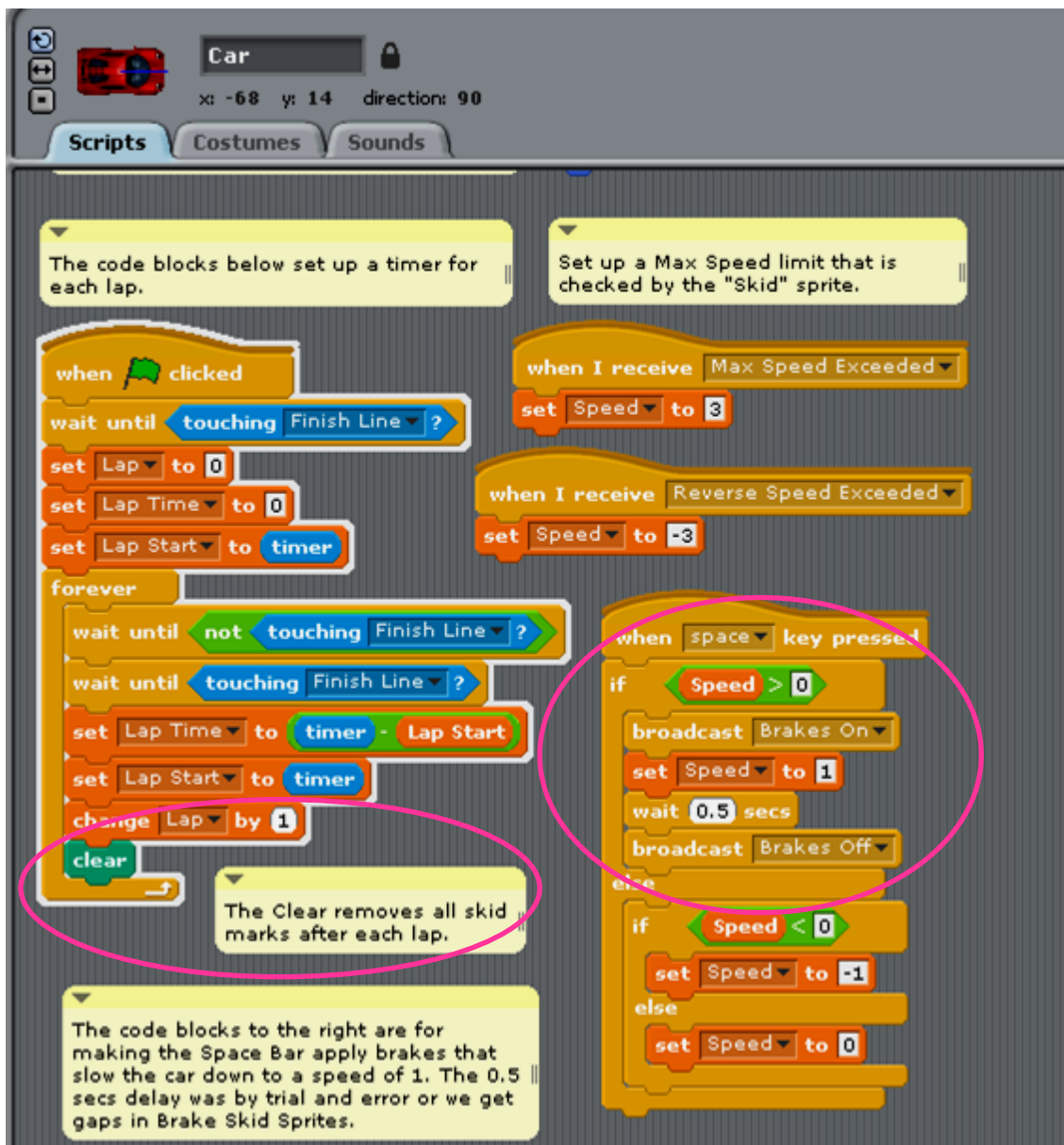
Setting Up Brakes Skidding

This involves using much the same code as in the Left and Right Skid sprites, but we do this in two separate new sprites called "LeftBrake" and "RightBrake".

These two sprites need to be drawn as just a dot in the middle of the editor. They remain hidden the whole race but move along with the car as a carrier for the skid pen.

The "BrakeDir" variable must be set up "For this sprite only".

We tried a number of script codes for the Brake Skids, but found that we had to have the Car Sprite send messages to the Brake Sprites by changing the Car Code to look like this:



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The Script Code for the Left Brake Skid is then set up with a Direction of Car -150 like this:

The screenshot shows the Scratch script editor for a sprite named "LeftBrake". The script is as follows:

- when clicked
 - hide
 - pen up
 - clear
 - set pen color to black
 - set pen size to 3
 - forever
 - set BrakeDir to direction of Car - 150
 - go to x: x position of Car + sin of BrakeDir * 15 y: y position of Car + cos of BrakeDir * 15
- when I receive Brakes On
 - pen down
- when I receive Brakes Off
 - pen up

Callout boxes provide additional information:

- "This script code leaves a single black skid mark on the track for the LEFT TYRE whenever the car's brakes are applied using the space bar. This Sprite receives a 'Brakes On' message from Car."
- "We have only set up for Forward Direction Brake Skids back in the Car Sprite script."
- "The variable 'BrakeDir' is for the direction of the skid, (Must be defined as 'For this sprite only') We found the value that works best is to set the skid direction to direction of car - 150. If we change this to -90, skid is outside car, if we make it -180 skid is too close towards middle of car."
- "Note that all skids on the track are cleared off at the end of each lap, and this is done in the Car Sprite script."
- "The 'Brakes On' and 'Brakes Off' messages are passed by the Car Sprite each time the Space Bar is pressed. We found checking for space bar in this script was not fast and responsive enough."

Note that the above scripting is the only one we could get to work.

If we try checking for When I receive Space pressed, or an If Space pressed, the response time is too slow and the skid appears on screen too long after the space bar is pressed.

The Right Brake Skid Sprite can be made by right click and "duplicate" on the left brake sprite (in the sprites area under the stage). The right brake sprite only needs the "BrakeDir" code changes to be + 150 instead of -150.

This image is a close-up of the "set BrakeDir to" block within the "forever" loop of the script. The value "- 150" is circled in pink, indicating the change for the right brake skid.