

TOAnimate

Academy

SIMPLE WALK CYCLE

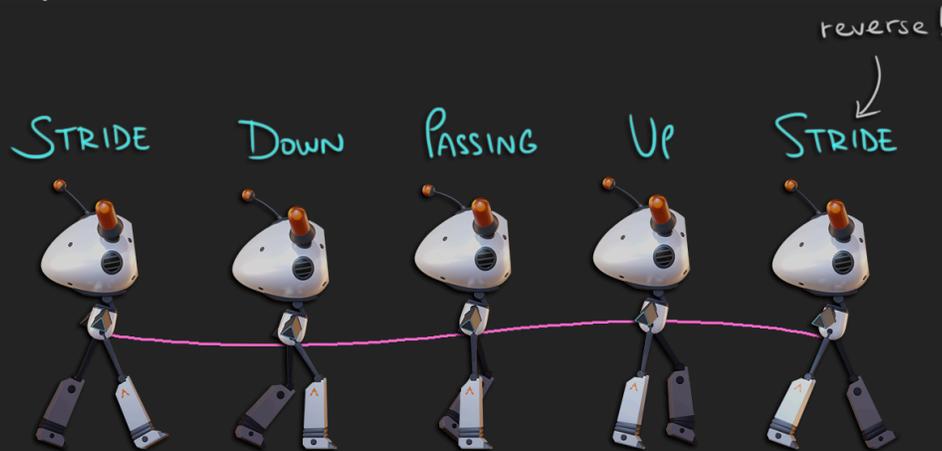
Key Poses

PHYSICS & ANIMATION PRINCIPLES AT PLAY

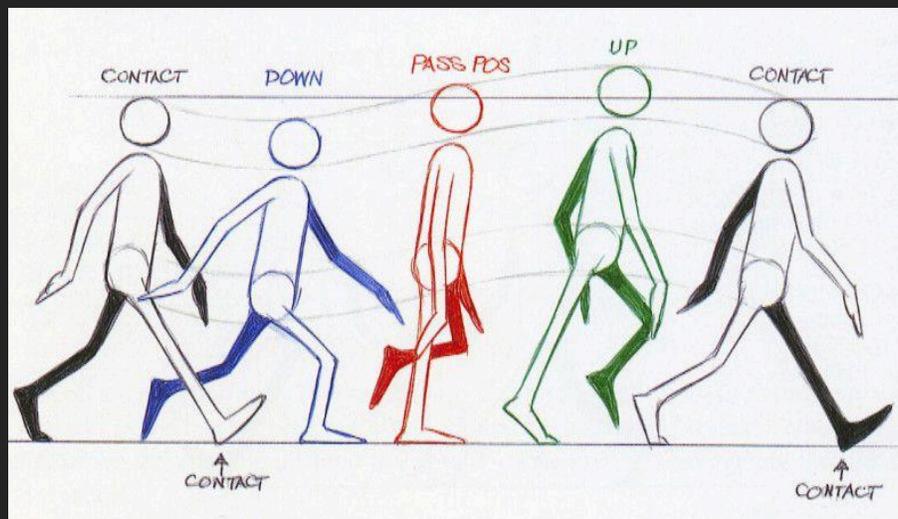
- **Weight shift:** The body sways from left to right as the character shifts weight from one foot to the other on the **passing** positions.
- ★ **Drag & Offset:** Robot's head and appendages (arms, lights, and antenna) bounce up and down with a 3 frame delay.

THE 4 KEY POSES OF A WALK CYCLE

Every walk cycle (regardless of style and personality) contains these 4 main poses: **CONTACT** (STRIDE), **DOWN**, **PASSING** (CROSSOVER) & **UP**. Here is what the poses look like in a standard walk cycle:



Here's a similar guide from **The Animator's Survival Kit** by Richard Williams (highly recommended!)



Learn animation in Blender from industry professionals at toanimate.ca

★ CONTACT (STRIDE)

- both feet are touching the ground (toes on the back foot and heel on the leading foot)
- this is the widest point of the walk
- the hip rotates along the **Rotation Y** axis with the stride
- there is equal weight on both legs, the body is centered, the **Rotation Z** axis is neutral
- arms swing in the opposite direction

★ DOWN

- the body drops down to its lowest point, both knees are bent
- the back foot is peeling off the ground and *slightly* moving forward
- the front foot is fully planted on the ground
- the hip is in an in-between position of the stride and passing positions

★ PASSING (CROSSOVER)

- the weight is fully on one leg
- the weight bearing leg is almost straight, the foot is fully planted
- the other leg is lifted and moving forward, the foot is dragging behind
- the weight of the body is above the straight leg (maximum sideway motion)
- the **Rotation Z** axis on the hip is rotated higher above the weight bearing leg

★ UP

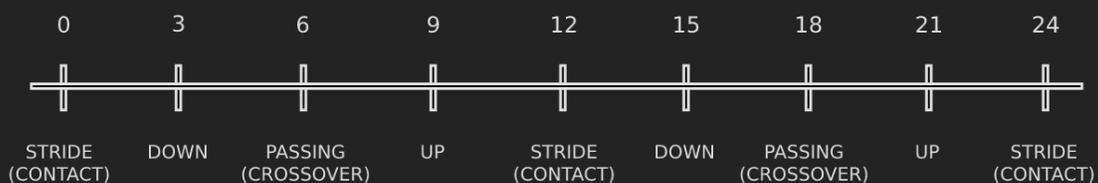
- the body rises to its highest position
- the weight bearing leg is peeling off the ground, the heel is lifted
- the passing foot is still dragging but the leg is kicking towards the front
- the hip is in an in-between position of the stride and passing positions

TIMING CHARTS

Standard walk cycles are usually **25 frames** long. This timing gives you a more brisk walk, making the character look like they're walking with purpose.

If you are aiming for a more casual stroll, try doing a **33 frame** walk.

BRISK WALK (13 FRAMES PER STEP)

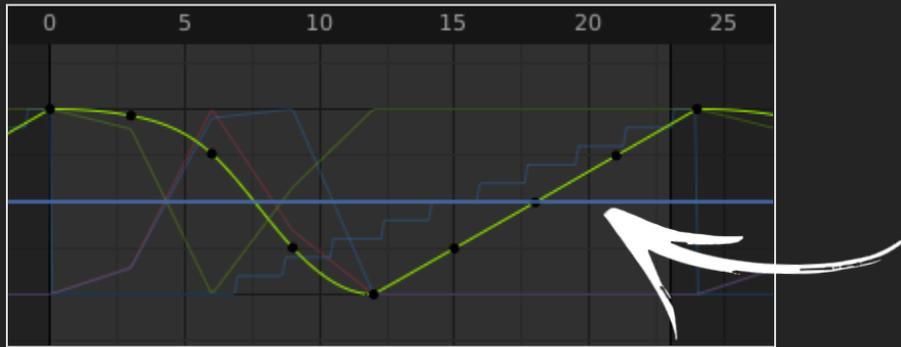


CASUAL STROLL (17 FRAMES PER STEP)



RULES OF A SUCCESSFUL TREADMILL WALK

- **Proper loop**: The first and last pose of the walk have to match perfectly.
- **Linear spacing on planted foot**: As soon as a foot touches the ground on the stride pose, its spacing has to be perfectly **linear** until the foot lifts off the ground again.



- **No forward/backward motion on the COG**: The center of gravity ('torso' in this case) cannot move forward or backward in space (side-to-side and up-and-down motions are fine).

EVERYTHING IS CONNECTED!

All body parts move together and affect each other's position. In a walk, this is especially true for the hip rotation, stride length, body height and foot roll. If you change one, you might have to adjust the other ones too in order to avoid leg hyperextension.



THE GOAL OF THE EXERCISE

Animate the TOAnimate Bot doing a simple treadmill walk over 25 frames. Focus on nailing the main body motion before adding any bounce on the appendages. Keep the animation *stepped* (**constant interpolation**) with a perfect loop.



THE EXERCISE



TIP: Based on your personal preference, you can either start the walk on frame **0** and end it on frame **24** (like we did in the video), or push everything by 1 frame, starting on frame **1** and ending on frame **25**.

BLOCKING

A) STRIDE

1. Key the entire character on frame **0**. Push one foot forward and rotate the heel so that the toes are in the air. Paste the same but reversed **Location Y** value onto the other foot and lift the heel off the ground. If the knees look stretched, you can bring the torso lower or shorten the stride to fix the issue.
2. Rotate the hips along the **Rotation Y** axis to push the pose more (keep it subtle).
3. Once you're happy with the pose, select everything and **paste** it onto frame **24**.
4. **Mirror paste** the stride pose onto frame **12**.
5. Select all of your animation and press **T > Constant**.
6. Make a looping animation by pressing **Shift+E > Make Cyclic**. Then shorten the Timeline to **23** frames.

B) PASSING

7. Go to frame **6** and with the entire character selected, press **Shift+E** in the Viewport and get an exact inbetween pose (**50%**).
8. Bring the torso up so that the weight bearing leg is almost straight.
9. Zero out any heel rotation on the planted leg (it should be completely flat on the ground).
10. Lift the other leg off the ground and rotate the foot to create a drag (we recommend using the *heel_ik* controller for this).
11. From the front view, shift the robot's weight over the straight leg along the **Location X** axis (keep it subtle).
12. Rotate the hip along the **Rotation Z** axis so that it's higher over the straight leg and lower over the passing leg.
13. Zero out the **Rotation Y** value on the hip.
14. **Mirror paste** the passing pose onto frame **18**.

C) DOWN

15. Go to frame **3** and with the entire character selected, press **Shift+E** in the Viewport and get an exact inbetween pose (**50%**).
16. Zero out any heel rotation on the front leg.
17. Grab the back foot controller and bring the leg back to travel only **~15%** of the distance along the **Location Y** axis.
18. Make sure the heel rotation is increasing as it peels off the ground (the **Rotation X** value should be higher than on the stride pose)
19. Bring the torso lower than it was on the stride pose (both knees should be quite bent).
20. **Mirror paste** the down pose onto frame **15**.

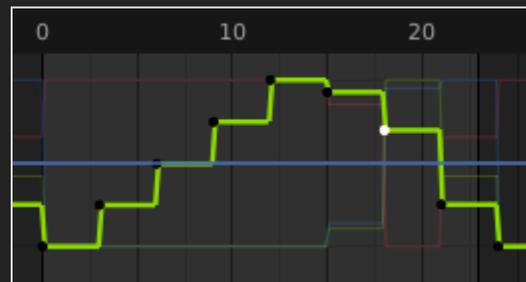
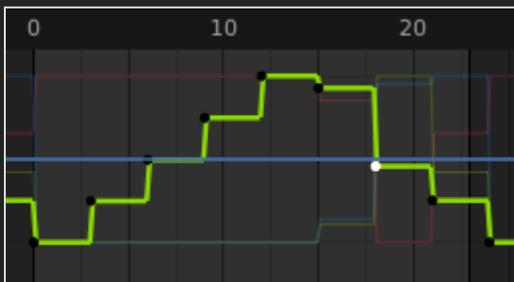
D) UP

21. Go to frame **9** and with the entire character selected, press **Shift+E** in the Viewport and get an exact inbetween pose (**50%**).
22. Grab the torso and bring it up into its highest position of the walk.
23. If needed, increase the heel rotation on the planted foot to avoid any knee stretch.
24. Bring the lifted foot up and rotate it to continue the drag.
25. **Mirror paste** the down pose onto frame **21**.
26. The main blocking is done! Don't forget to **save your file**.



REFINING THE ANIMATION

1. Hip: create an ease-in and ease-out on the **Location X** sway, as well as **Rotation Y** and **Rotation Z** values.
2. On the **passing** positions, you can bring the lifted foot closer to the body to add more interest (**Location X**). Make sure that there is no side-to-side movement on the foot when it is planted, otherwise the foot will look like it's sliding.
3. Globally rotate the feet outwards (**Rotation Z**).
4. Feel free to add some foot rotation on the **Rotation Y** axis when the foot is lifted off the ground (**passing** position).
5. On the **passing** position, adjust the spacing of the foot's **Location Y** curve if there is a big pop.



6. Animate the **head bob**: first, rotate the head up on the down position and reverse it on the up position (passing and stride are the in-betweens). Then shift the whole animation on the **Rotation X** axis back by **3** frames to create an offset (**G+Y-3**).
7. Repeat the same process with the **antenna, lights** and **arms**.
8. If you like the look, you can globally rotate the arms lower on the **Rotation Z** axis to make them hang more like real arms.
9. Adjust the bob values to your liking and add some ease to the curves.
10. You're done! **Save** your file & create a **playblast** to check your work in real time.





ANIMATION CHECKLIST

- The walk cycle contains all 4 key poses
- The animation is looping correctly
- The planted foot is moving in a linear fashion
- The torso isn't moving forward and backward
- There is a nice up and down bounce on the body
- The weight is transferring from one foot to the other on the passing positions and the hips are reacting accordingly
- The legs aren't hyperextending
- I have added eases wherever needed to make the spacing more dynamic
- I have added bobbing to the head and appendages
- I have checked my curves and cleaned up any hiccups
- My work is saved
- I made a playblast and checked my animation in real time from various angles