Xemo – A Player’s Guide

The purpose of this guide is to help players with the Early Access version of Xemo. We know that the game needs work and we have great plans to add features and content. This guide should help you through some of the rough spots as we improve Xemo.

Getting Help

In the early stages, people will need help figuring out the game. We are dedicated to helping you! You can send email to support@play.xemo.io or message us (xemorobots) on Steam. We also have a support website at https://play.xemo.io/support that you might find helpful use.

Launching Xemo from Steam

This is fairly straight forward, it launches like any other Steam app. At startup Xemo does check for your SteamID and uses that to create an account for you automatically on our gameserver. This gameserver is used to track game usage (levels us, scores) and to store the motions and sequences you create for the robot.

If you start Xemo without having your Steam client running, then you’ll see the regular login screen below. If you don’t yet have an account, you can create one by clicking on the “create account” text. This will take you to the xemo.io support website where you can create a new Xemo account.
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The Top Left Menu

The menu is used to show/hide the different parts of the Xemo simulation game. The icons, from left to right, are described below.

Robot Select: Choose from a list of pre-made robots. The game includes four robots. Xemo (the biped) is the most challenging to control.

Level Select: Try your robot out on multiple game level challenges. Start with easy (#1) and progress through the increasing difficult challenges. There currently 16 levels in the game.

Motion Creator: You create motions by making posture key frames. The Xemo simulator will control the joints to match the joint angles that you set for each frame time point.

Evolution: Instead of creating your own motions by hand, you can evolve robot motions in the evolution chamber. This runs an evolutionary algorithm (a type of optimization) to create what seem like random motions that move the robot forward. Lots of fun to see the crazy types of motions that evolution can create.

To play the game, start with the default robot (Sami). Then go into Level Select and watch the tutorial video for Level 1. After watching the tutorial, you’ll be instructed to create your first robot motion.
Robot Selection
There are four robots to select from. Sami is the easiest, and the one that is loaded by default. We suggest that you start with Sami and work through the tutorials and the game levels. Buster is also fun and easy. Fido and Xemo are quite hard, and xemo requires balance control in order to walk.

Three of the four robots are shown here.

Sami is loaded by default. Start with this robot.
**Level Select**

Each of the challenge levels requires more skill and new motions as you progress. Start with the simplest robot, and move to a more complicated robot when you reach a level where more robot motion agility is needed.

To start a level, click on the desired level and then the **Play** button. After you play the first level in a track (*Forward* is one track), then all levels in that track are unlocked. Starting a level will transport your robot to the challenge floor. Pressing the **Start** button will drop the robot to the floor and start the challenge timer. In each challenge, your goal is to get the robot to move to end end of the path to the blue-green circle as fast as possible. Points are awarded for speed.
**Motion Hotkeys**

When you create a new motion, you can assign a single keystroke to run that motion during a game challenge level or anywhere on the floor. During game play, the motion HotKey list is displayed. Pressing the assigned key will start the motion to completion. If you are still holding the key at the end, then the motion will repeat. In this example you could press [S] to start the motion, press and hold down [W] to walk continuously, and the press [E] when you’re ready for the robot to stop.

![Motion Hotkeys](image)

**Motion Creator**

Creating motions in Xemo is done by setting posture key frames using the motion pattern editor. The player creates multiple key frames on the timeline and then adjust the robot position for each key frame. You can play back the motion while the robot is suspended in the gravity well. But that motion will look different when on the ground since the robot will be working against gravity. For each posture key frame (the circles in the timeline) you can adjust the joint positions, the joint strength and the auto balance values. These can be combined together to create very complex motions that include flips, spins, walking, crawling, the worm and may other creative moves.

![Motion Creator](image)

The pattern editor timeline is displayed above. The numbered circles are posture frames. The are set along the time line from 0.0s to the end time, in this case at 2.0s. You can drag the frames along the timeline, delete frames, or create new frames. If a frame is selected (#1 in this example) then adjusting the robot joints, springs or balance will be saved with that frame. Dragging your cursor on the timeline between the frames will cause the robot to move using interpolated values for joints angles, strength and balance.

The controls on the left are for rewinding, playing and looping the motion. The playbutton sets the controller running. But the simulation is always working. The snail icon (faint gray) is for slow-motion – it slows down time for the physics engine so that you can carefully examine what’s happening.

The controls at the far right of the timeline are for adding and deleting key frames.
The text box display 2.0 at the right of the timeline is the period. That’s how long, in seconds, it will take the controller to execute the motion before either stopping or looping around.

Any changes you make are saved automatically. In future, you’ll be able to share your motions with other players and also capture and display replays of these same motions outside of the game.

**Motion List**

The motion list displays the motions that you’ve created and provides controls to add and remove motions. The motions are robot specific – they only work on a particular type of robot since they depend on the joints available for that robot. Clicking on an item and then clicking the Load button will load that motion and move the robot to the first posture frame in the motion.

The green Plus button will add a new motion. For each motion, there are buttons to duplicate (create a copy) and to delete. Clicking on the keyboard on the right will assign the chosen key to the selected motion for game play. Keys already assigned to other motions have boxes displayed around them.
**Camera View**

You can change the view of the camera using these controls:

- **Mouse drag background**: rotate view around robot
- **Ctrl-Mouse drag**: zoom in/out (for laptops)
- **Mouse wheel**: zoom in/out
- **Shift-mouse drag**: move camera up/down

We also have a First-Person camera mode that lets you wander around the robot lab complex for fun. This is a temporary thing until we put in better camera controls. But check it out. You can see some of the cool work that the designers on our team have done with the environment art.

Press C-A-M together switched from regular cam to first-person camera.

In FP camera mode, use the keys W-A-S-D to move and the mouse to control direction. The Shift key speeds up your movement and Spacebar will jump. The screen shot below was taking using the FP camera.

![Camera View](image-url)
Gravity Well
The gravity well is a tool to help you set the position of the robot without interference from gravity. This is particularly important if you are creating walking, crawling, jumping or other motions that are difficult to change while on the ground.

The gravity well is used to raise, lower and rotate the robot. In the ON state, it suspends the robot in the air. In the OFF state, the robot drops to the ground. The gravity well can be used to reset the robot position as well. Note: It is possible that the robot limbs get twisted, and turn the well ON and OFF may fix the twist. We’ve mostly fixed this problem in release 1.3, but if you get stuck limbs you can try this option.
**Joint Positions**

You can adjust the joints by clicking on an orange joint circle (see picture below) and moving the sliders. The robot moves the joint as you adjust. You can also adjust multiple joints at once. Click on the first joint and then Shift-Click on additional joints.

The Joint Position control contains a set of three rotation sliders. Each slider is used to adjust the angle for one degree of freedom (DoF). The robots joints are rotational, so adjusting the angle means rotating the joint around some axis X, Y or Z. Joints like the knees only have one DoF. Ankles have two DoF, and shoulders and hips have 3 DoF. If you hold the Ctrl key down, you can make fine adjustments of 1 degree. Otherwise the slider will snap to the nearest 5 degree value.

The DoFs and the angle range will be limited by the most constrained joint. For example if you click on shoulder and knee, then you can only adjust one DoF even though the shoulder has three DoF.
It’s possible to adjust two joints in opposite directions. We call this **anti-phase**. For example, click on the left hip joint. The joint icon for this hip turns green. Now Shift-Click on the right hip joint. Shift-Click again and you see that the joint icon turns red. This means it will move in the opposite direction to the first joint selected. Anti-phase settings are used in creating walking or crawling motions.

The **Reset All Joints** button will set all the robot joints to zero, which is the default position for the robot.

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**Joint Springs**

The joints are modeled using a spring/damper approach. The spring strength value sets the torque at which a joint tries to reach its target position – the angle that you set using the Joint Position tool. The damper is used to reduce overshoot or oscillations. The default values work well, but you can increase the strength value to make the movements faster, jumps higher, etc. When trying to jump high, set the damper value to 0.5. Keep in mind that the robot controller will interpolate the joint spring values along the timeline. So, moving from 200 to 600 in strength happens as the robot moves from one posture to another.

*interpolate means the controller calculates the strength values for you from one position to the next as time advances. We use linear-interpolation.*
**Robot Auto Balance**

The bipedal robot won’t automatically balance by default. Use the **Auto Balance** controller to specify how much the ankles adjust to balance the robot in the forward and sideways directions. Each of the sliders can be set in the range from 0.0 to 1.0. The balance control mixes your desired motion with the motion required to balance the robot. A value of 0.5 means that it will equally mix your desired angle for the ankle with the controller’s desired angle. The balance only works when the robot is on one foot. As soon as two feet are on the ground the robot no longer uses the ankles to balance.

To use this, first try to get the robot to balance on one foot. That’s the first exercise in working toward a walking motion. The trick to balancing is to shift the weight of the robot so that the Center of Mass is directly over the foot on the leg that will support the robot.

Balance is tricky, and we’re busy developing better automated balancing algorithms to support the robot while jumping, landing, running and brisk walking.
Center of Mass
To help you along with balancing, we’ve provided two markers in the game to indicate where the center of mass is with respect to the body and the floor plane. The white arrows in the figure below show the Center of Mass (CoM) (the checkered ball) and the Center of Gravity (CoG) - the checkered disk on the floor. To make the robot stand up, you’ll need to make sure that the CoG remains in an area between the feet.
Exiting the Game

In the upper right corner of the screen, you’ll find the Exit Icon, which will take you back to the main menu.

Feedback Panel

We really value your feedback in helping shape the game and fix problems. The Feedback button will pop up a text box (see below) where you can type in a suggestion (or note of encouragement!) for the developers. These messages are sent through our game server to our email. We get them almost immediately, and we reply to all of them. (The ones that make sense, anyway).

Enjoy the game! If you need help, send an email to support@play.xemo.io or visit our support website at: http://play.xemo.io/support.

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