PLEN Motion Editor

Operation Procedures

Temporary File

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I. Introduction

1. Overview of MotionEditor

This MotionEditor is a software that can connect the robot to a PC, configure the basic settings, and create/manipulate the motion.　Using each servomotor, you can create various postures, and combine those postures to create a series of motions such as walk, run and so on.

You can also call a motion to operate the robot.

2. Operating Environment
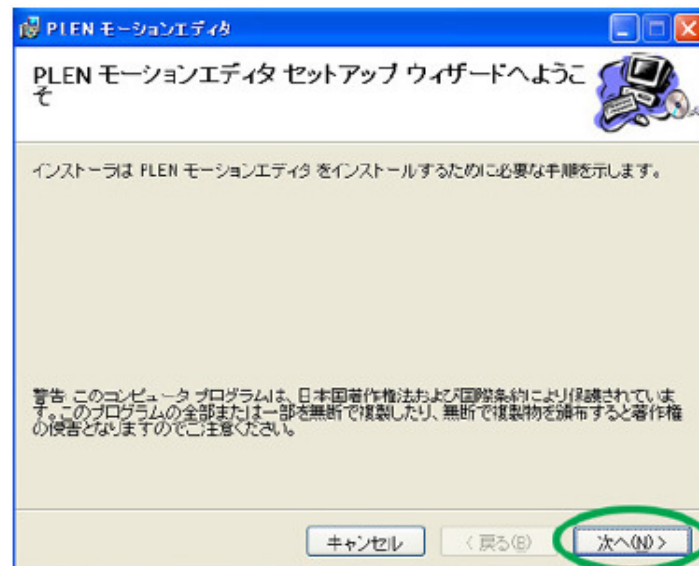
OS ·············· Windows XP

PC with one or more USB ports

3. Installing the MotionEditor

The following describes how to install the MotionEditor.

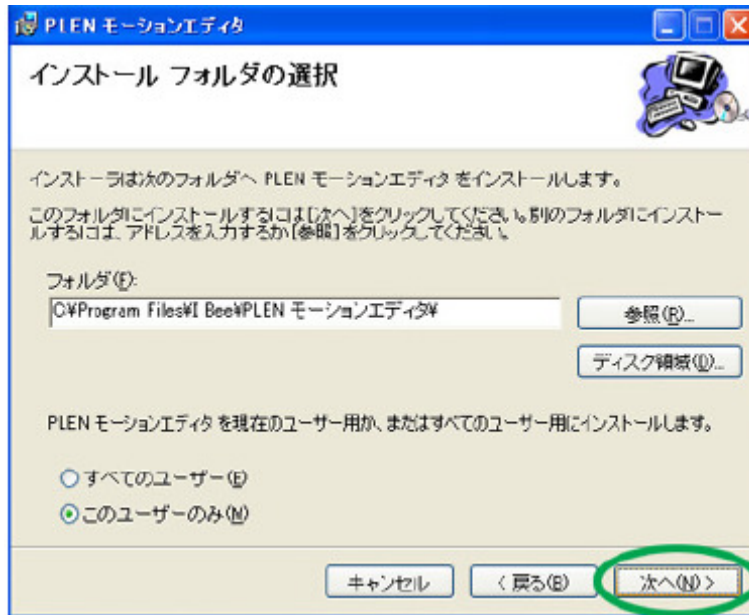(1) Execute the Setup.exe located in the supplied CD-ROM.
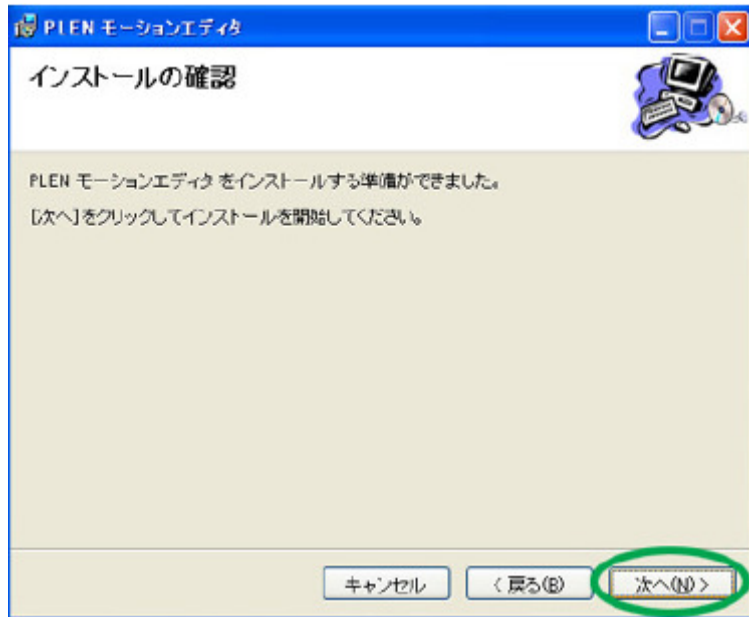

(2) Click the Next button.
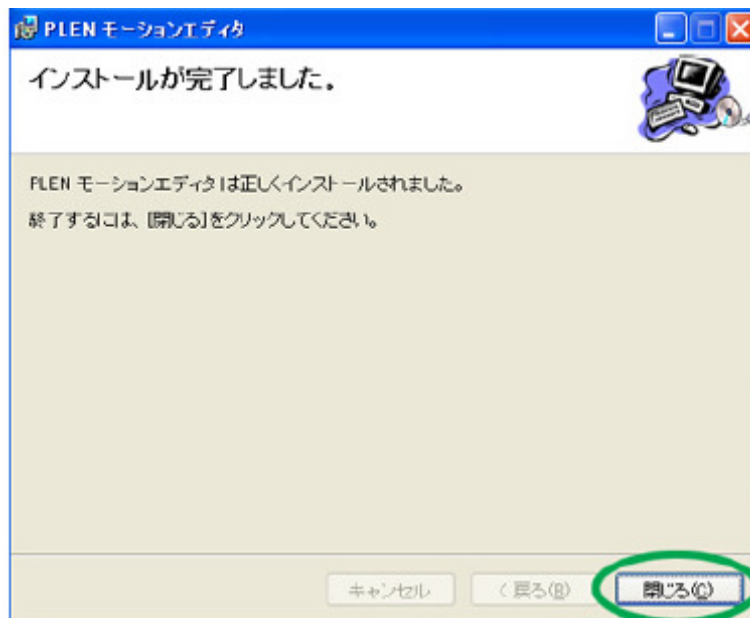
(3) Then again click the Next button.

    * If you want all users who use this computer to be able to run the MotionEditor, select the
"All Users" radio button.

(4) The Installation Confirmation window appears. Click the Next button in it.

(5) The Installation Completion window appears. Click the Close button in it.

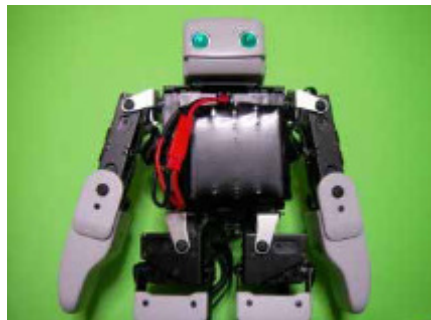**4. PLEN's Preparation to Use the MotionEditor**

(1) Charge the integrated battery.

(2) Ensure the switches on the back of the PLEN are turned OFF.　The left one is a power switch of the control board; the right one is a power switch for the servomechanism.

(To turn off these switches, lower them as shown in the picture below.)
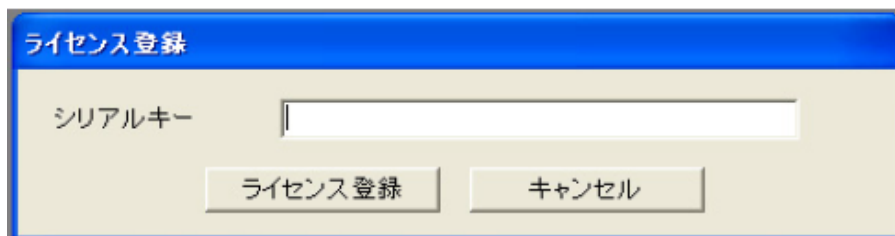

(3) Connect the fully charged battery.
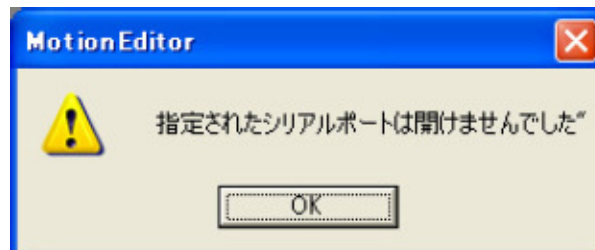
5. Set up the MotionEditor for Use

(1) When the installation is completed, the PLEN MotionEditor's icon will appear.   Double-click it to launch the software.

(2) The license registration window will appear.   Enter the serial key number into the box and then click the "Register License" button.

(3) Because the robot is not connected at the beginning, the message "The specified serial port could not be opened." will appear.   Press the OK button as it is.   If the window shown on the next page appears, the setup is completed successfully.

* The window shown below appears right after launching the MotionEditor.

* If this window appears, the setup of the MotionEditor is completed successfully.
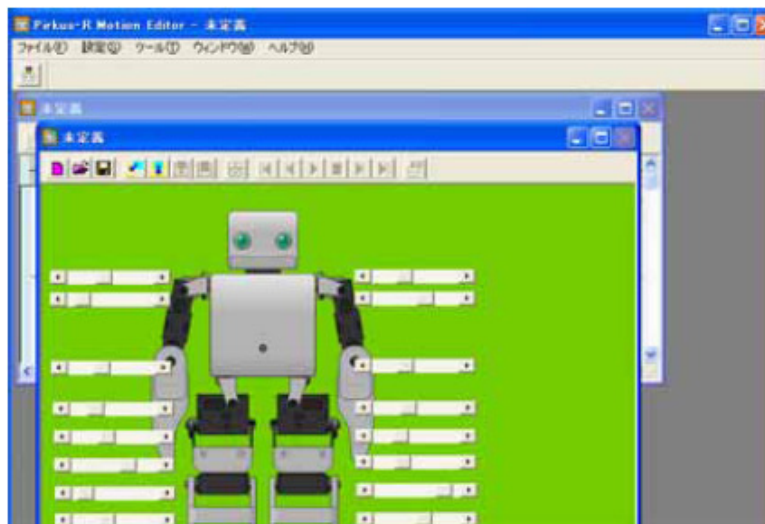
II. Caution for Connection Before proceeding to the next step!!

The servomechanism will be powered in the next step.　　When you find <u>any servo is under a load</u> right after the power is turned on, <u>turn off the power immediately</u>.

* Servos will break if placed under a continuous load. When the servo is hot, only continue the operation after the outer casing has had sufficient time to cool off.

Countermeasures against the above condition
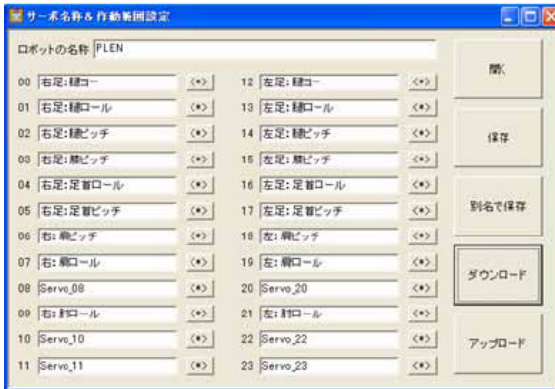
In the dialog for the origin setting, names corresponding to joints of the PLEN are listed; ex. "Right Thigh: Yaw".

Press the "<*>" button on the next to the box indicating the joint name corresponding to the servo being under a load.
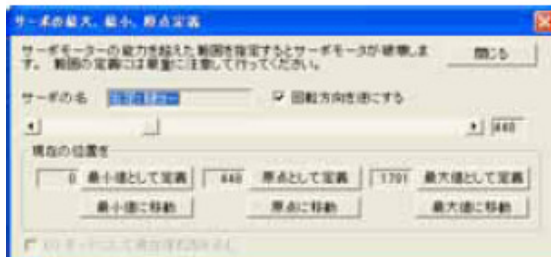
Slide the slide bar (refer to the left figure) to the direction in which the load is taken away from the joint, and then press the "Define as Origin" button.

This is a provisional measure.　　The proper origin must be set according to the following steps.

III. Connecting with Robot

1. Connecting a USB cable to the Robot and the PC

(1) Connect one end of the supplied USB cable to the PC and then connect the other end to the Robot.

(2) Turn ON the power switch button on the robot to feed power to the servos.

(3) Click the "Link to the Robot" button on the upper left of the window.

When the link is established successfully, the icon of the button will change into the one shown in the right figure bellow.

* When launching the software after connecting the cable to the Robot and the PC, the icon of the "Link to Robot" button is shown as in the right figure.

* If the connection cannot be established even if trying repeatedly, check to see the Robot is correctly recognized as a USB device. When the Robot is correctly recognized, it is confirmed in the "Device Manager" window in the "System Properties" as shown below.
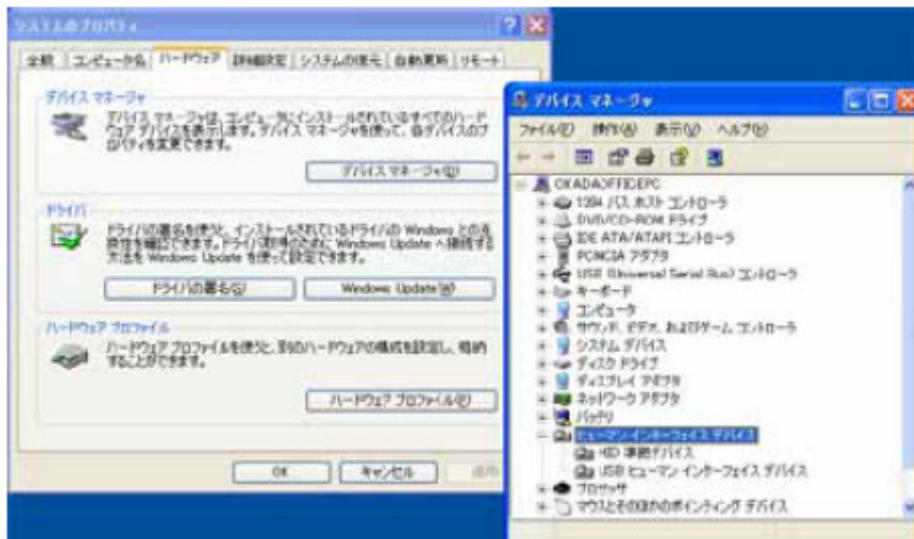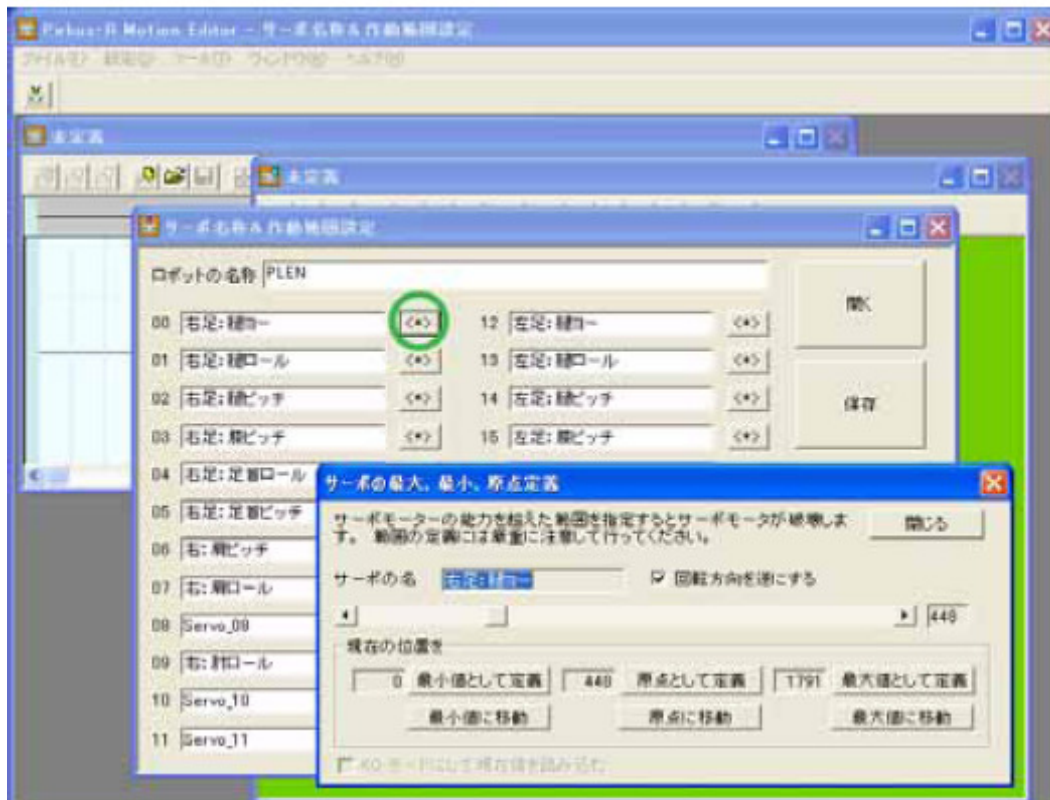
2. Basic Settings of the Robot - Setting the Origins -

(1) Select the "Define the Servo Name and the Motion Range" from the Settings menu.
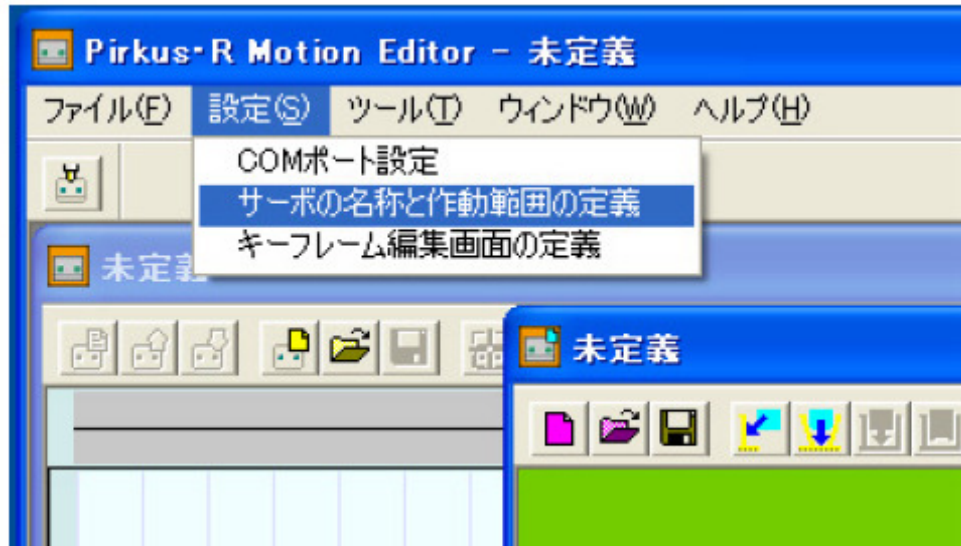
(2) Click the "<*>" button on the next to the box indicating the servo name to display the definition window of the maximum, minimum and origin coordinates of the servo.

(3) Set the values for the maximum, minimum and origin coordinates.

Slide the scroll bar shown in the middle of the window while holding the robot with one hand. The robot will move according to the motion of the slide bar. Check the movement and the servo's position with your eyes and then set the values.

After the value for each coordinate has been identified, click the definition button for each value. The set value will appear in the box on the left of the button. When all of the coordinates have been set, click the close button in the upper right of the window to close the window.
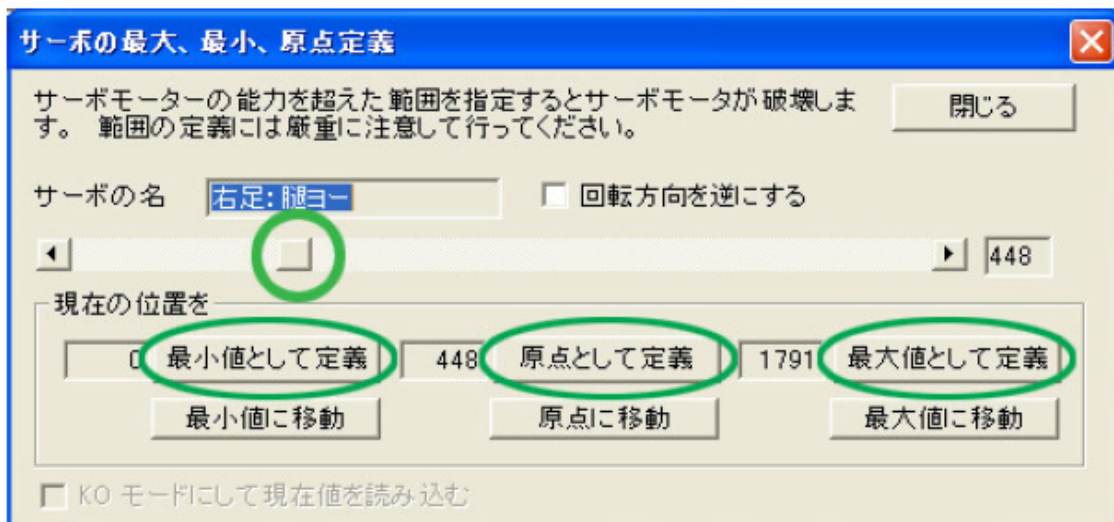
* The "origin" refers to the coordinate of the servo while the robot is in an upright (standing) posture. The "maximum" and "minimum" values of the coordinates vary according to the position of the servo. For example, in the case of the "Left Shoulder: Pitch," the maximum value refers to the position in which the arm is raised right over the head, and the minimum value refers to the position in which the arm is raised backward.

* Set the coordinates for each servo following the same procedure.

(4) For setting the origins of each servo, refer to the followings.

1 Set the origin of the left shoulder pitch referring to the left picture.

Place the silver aluminum part holding the arm and the shoulder line parallel to each other as shown in blue lines before, then set the origin.

Set the right shoulder pitch in the same manner.

2. Set the origins of both arms' roll and the roll of the elbow while keeping the arms and the forearms aligned straight.

For the roll of the shoulder, to prevent the arm contacting with the leg, set the origin to keep the tip of the arm approximately 2 cm apart from the leg as shown in blue lines in the picture.

3. Set the origins of both thighs' yaw while keeping both feet parallel to each other as shown in blue lines in the left picture.

4. Set the origins of the both thighs' roll while keeping the servo and the body part parallel as shown in blue lines in the left picture.

5. Set the origins of the thighs' pitch, the knee pitch and the ankle pitch for both legs while keeping the screws of each joint (indicated in blue circles in the left picture) aligned straight.

The left picture only shows the left leg. Set the right leg to the same condition.

6. Set the origin of both ankles' roll while keeping the servo and the leg parallel as shown in blue lines in the left picture.

(5) Save the set values and then store them into the servos.

After setting the approximate origin according to the above procedure, save the origin data and then upload them to the PLEN.　Click the Save button and the Upload button in that order on the right-hand of the window.
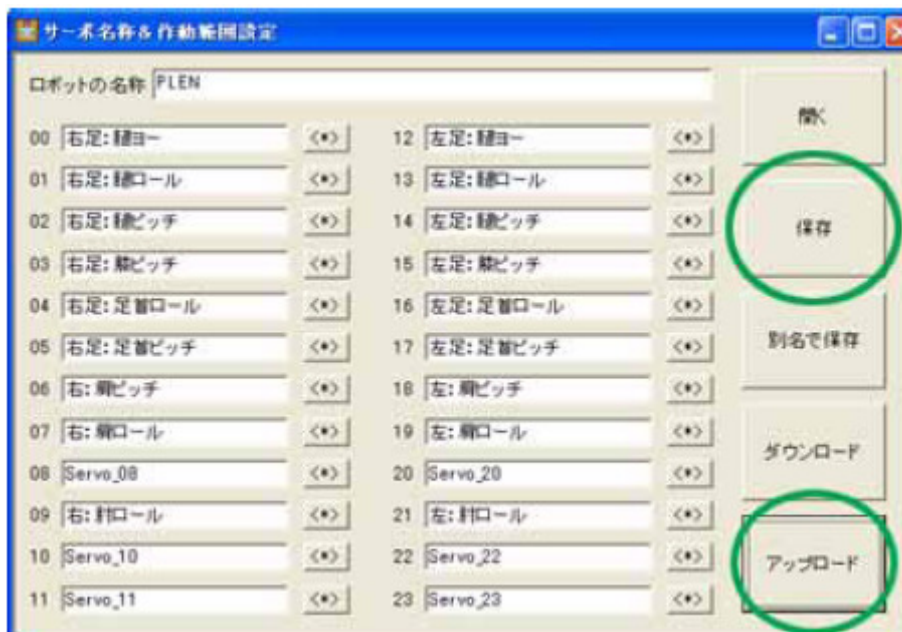
When the data are uploaded successfully, the window shown below will appear.　Click the OK button.
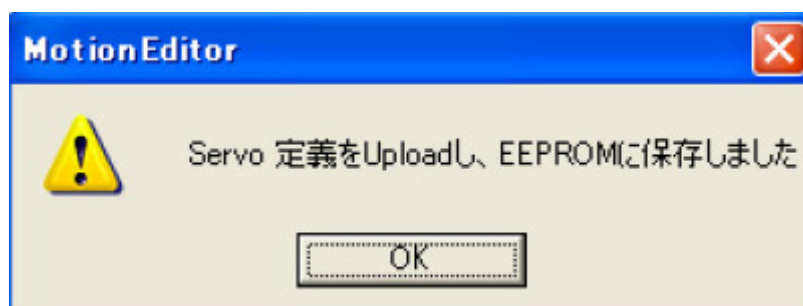
(6) Functions of the Other Buttons
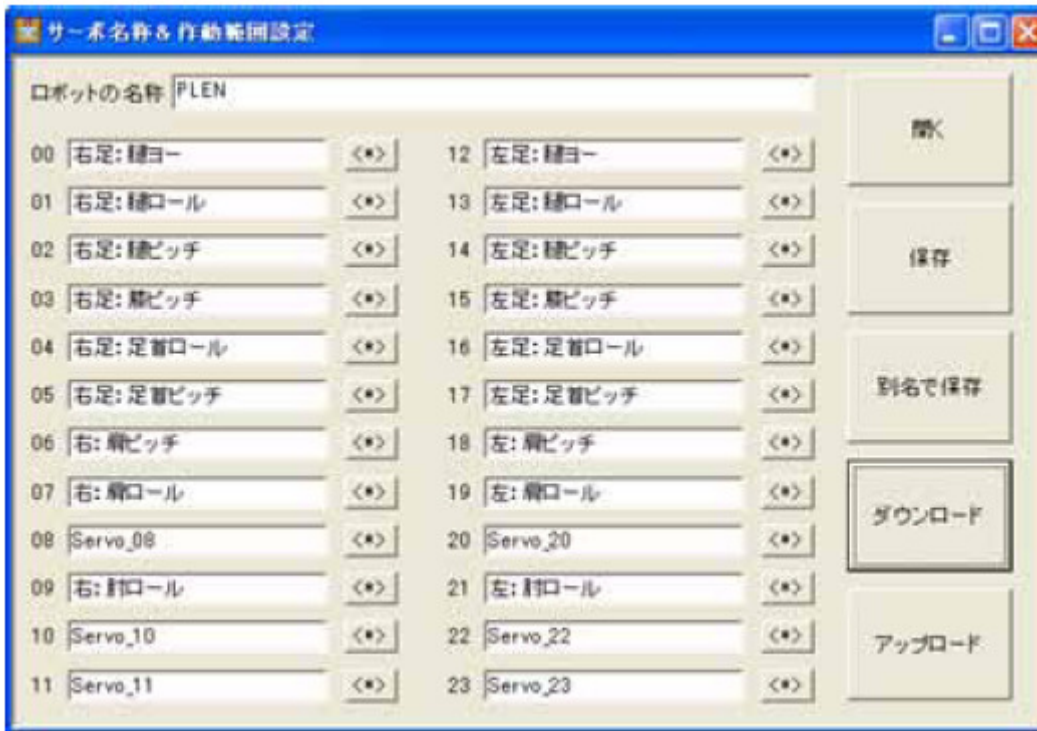
Open … Opens the motion range setting file saved in the PC.

Save … Saves the motion range setting file into the PC.

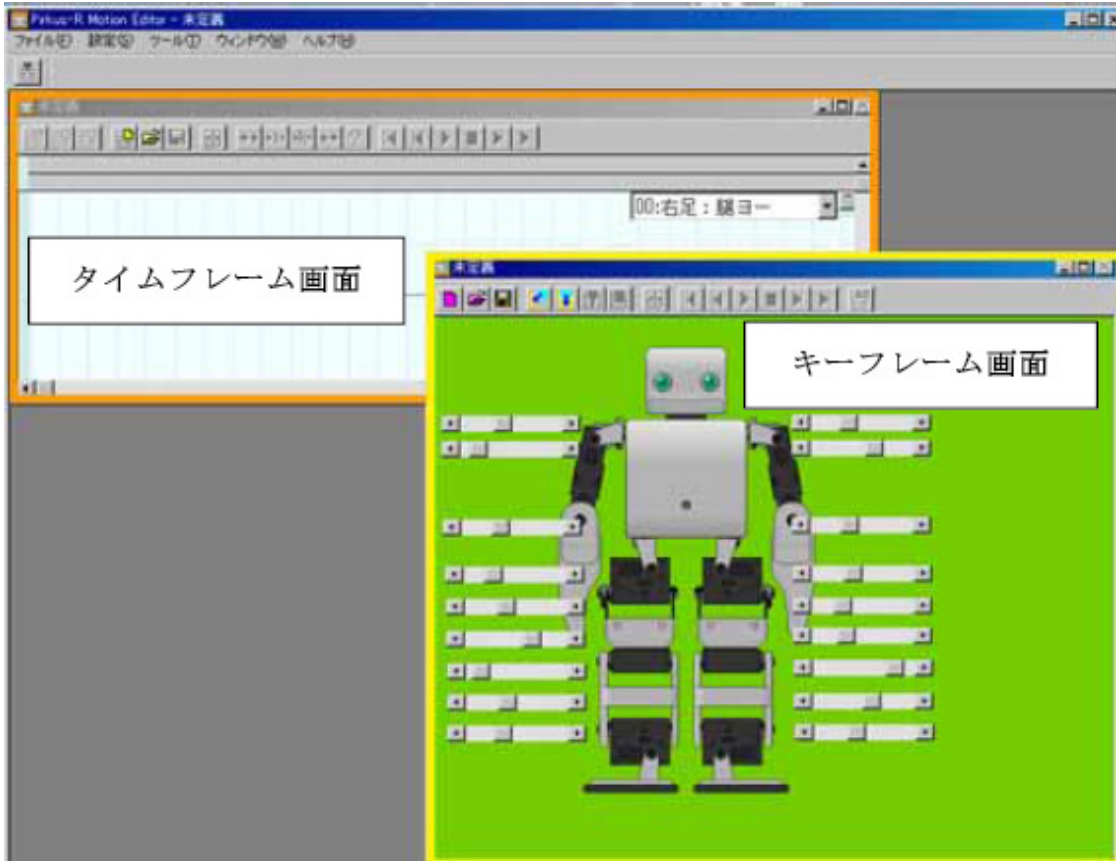Save As … Renames and saves the motion range setting file into the PC.

Download … Downloads the motion range settings stored in the servos.

(7) When the setting of each servo has been finished, click the close button ([x]) in the upper right of the window to exit the window.

IV. Creating Motions

1. Names and Functions of Windows and Buttons

(1) Names of Windows

Key Frame window = To move the robot mainly in this window to create the key frame.

Time Frame window = To set the timing of the motion in this window.

(2) Names of Buttons

Motion List = Displays the motion list stored in the robot.

Register into EEPROM = Stores a motion being created or modified into the robot.

New Motion = Creates a new motion.

Open Motion from File = Opens a motion saved in the PC.

Save to File = Saves a motion created or modified to the PC.

Restore Robot to Origin = Restores each servo to the origin position.

Shorten Time between Frames = Shortens the time between each frame (interval).

Set Time between Frames to 1 sec. = Sets the time between each frame (interval) to 1 second.

Halve Time between Frames = Halves the time between each frame (interval).

Lengthen Time between the Frames = Lengthens the time between each frame (interval).

Add Key Frame = Adds the key frame created to the Time Frame window.

Insert Key Frame = Inserts the key frame created or modified to the Time Frame window.

Refresh Key Frame = Refreshes the modified key frame.

Delete Key Frame = Deletes the displayed key frame.

Move to Top of Key Frame = Moves to the top of the key frame created within the Time Frame window.

Back to Previous Frame = Moves to the previous frame of the frame created within the Time Frame window.

Replay Motion = Replays the key frames created within the Time Frame window from the top.

**Stop Motion** = Stops the motion being replayed.

Proceed to Next Frame = Moves to the next frame of the frame created within the Time Frame window.

Move to Last Frame = Moves to the last key frame created within the Time Frame window.

(3) Operate the PLEN with the Supplied Motion to Ensure it Functions Properly

The supplied motion data is usually located in "C:¥Program Files¥I Bee¥PLEN モーションエディ ィタ r¥Data¥MotionFiles."
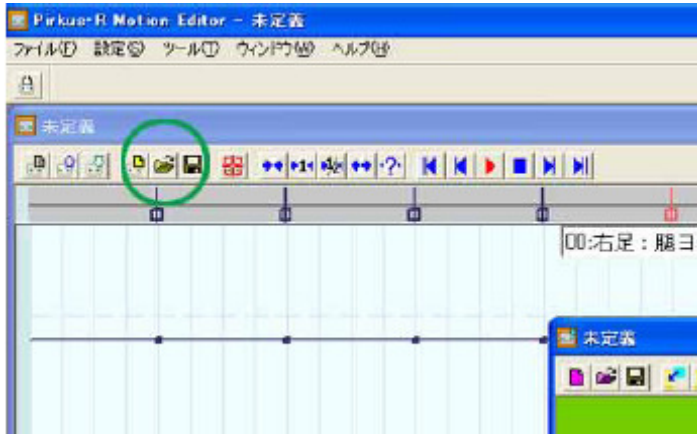
Open the supplied motion data from the Open button shown in the left figure.

Select a simple motion such as "Lifting up a Box" at first time.

Click the [▶] button on the right of the tool bar.

The PLEN will start the motion.

If some of the supplied motions are correctly reproduced, the system is functioning normally.

If the motion of the robot seems to get out of balance, check and modify the origin settings. The motion may be improved only by correcting the origin settings.

However, if any motion of the robot seems not to be improved even after the origin settings are corrected, try to reconstruct that motion referring to the following manipulation procedure. In this case, make sure to back up the original file.

**2. Creating Motion**

(1) General Process of Motion Creation

    i. Grasp the outline of the motion and posture of the robot while moving the robot by hand.

    ii. Create and add the key frames corresponding to the intended motion and posture.

    iii. Reproduce the motion once.

    iv. Correct the motion in detail and update the key frames.

    v. Adjust the time.

    vi. Repeat the step ii to v until the motion becomes smooth enough.

    vii. Save the well-made motion in the PC.

    viii. After the motion is completed, transfer and store it into the robot.

Generally you will create a motion according to the above procedure, however, the sequence of the steps should not necessarily be maintained. You can create a motion according to the way and the procedure you feel comfortable.

  * Do not leave the servos powered on for a long time.

  * If the servos become too hot, malfunction and/or failure might occur.

  * Have some breaks during the process.

(2) Creating a Simple Motion

  As an exercise, let's create a simple motion ("raise up the right arm and wave the hand").
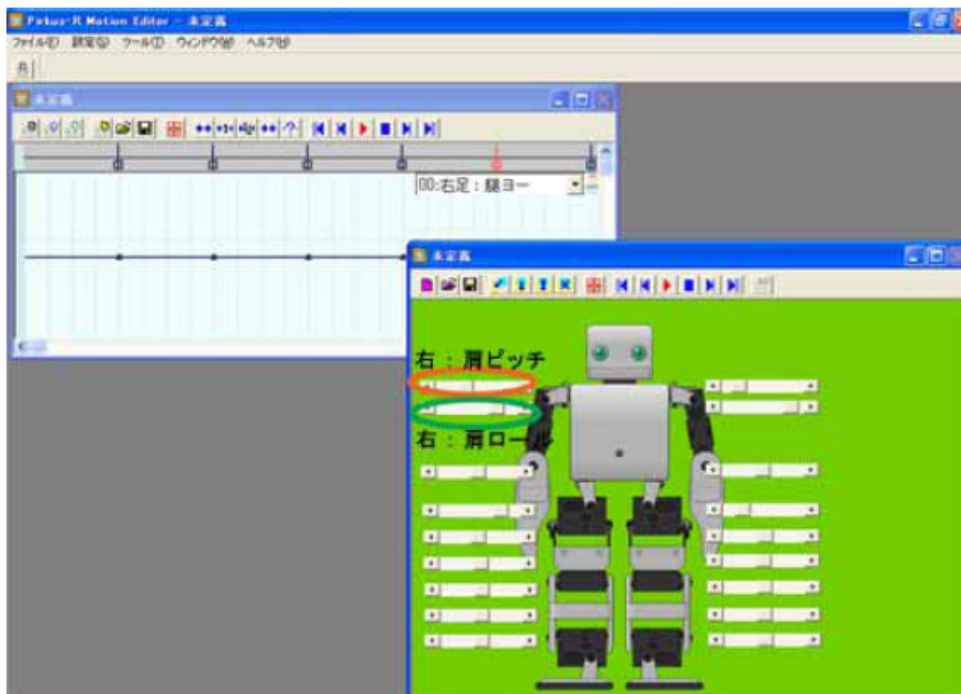
1) Establish the link ![button] between the PC and the robot.

2) Press the Restore Robot to Origin button ![button] to make the robot to restore the upright posture.

3) Press the Add Key Frame ![button] button. The marker ![marker] is added to the Time Frame window.

4) Move the Right Shoulder: Pitch scroll bar in the Key Frame window to raise up the right arm.

5) Click the Add Key Frame button ![button] to add the key frame corresponding to the motion in which the right arm is raised.

6) Move the Right Shoulder: Roll scroll bar in the Key Frame window to wave the right arm outward.

7) Click the Add Key Frame button ![button] to add the key frame corresponding to the motion in which the right arm is waved outward.

8) Move again the Right Shoulder: Roll scroll bar in the Key Frame window to wave back the right arm inward.

9) Click the Add Key Frame button ![button] to add the key frame corresponding to the motion in which the right arm is waved back.

10) Repeat the step 6 to 9.

11) Press the Restore the Robot to the Origin button ![button] to make the robot to restore the upright posture.

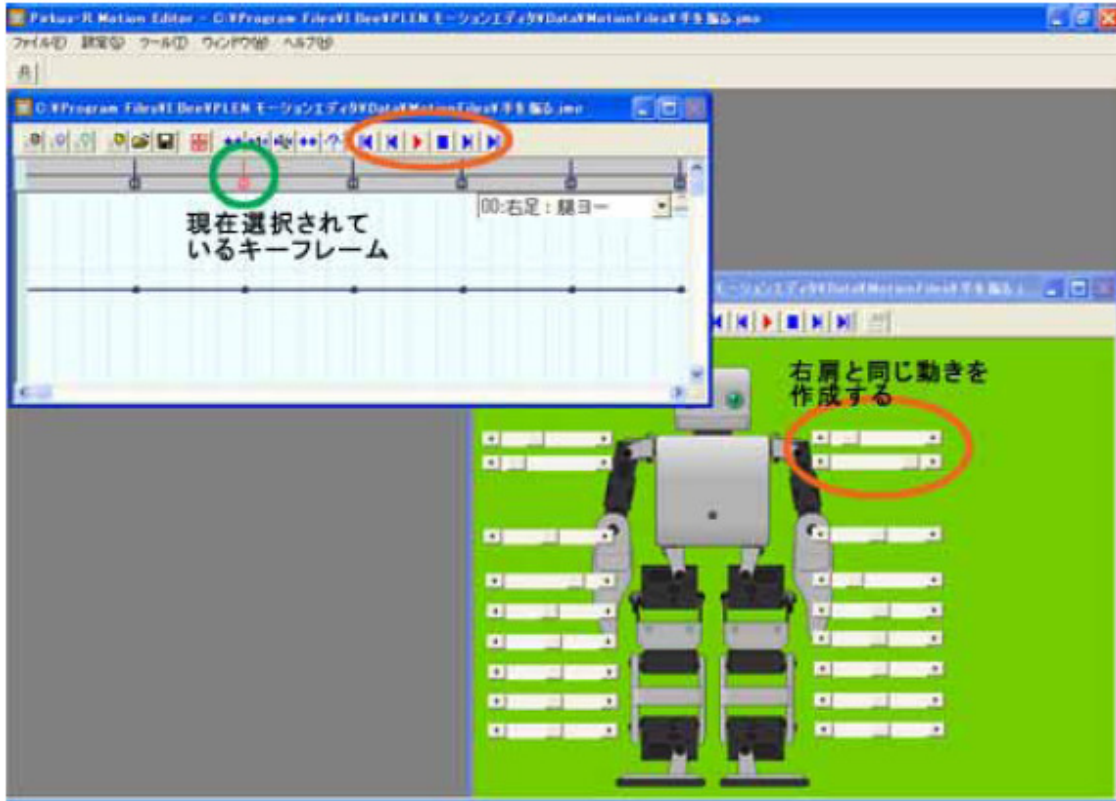12) Press the Add Key Frame button ![button].

13) Click the Save to File button in the Time Frame window to save the created motion.

A simple motion "wave a hand" is completed.

To ensure the motion is correctly reproduced, click the Replay Motion button

(3) Modifying the Saved Motion

Modify the created "wave the right hand" motion into a "wave both hands" motion.

1) Click the Open Motion from File button to load the saved motion.

2) Using the Proceed/Back buttons, select the key frame to be modified. The selected key frame is displayed in pink.

3) Move the scroll bar for the Left Shoulder: Pitch and the Left Shoulder: Roll to move the servos to the position corresponding to those of the right arm.

4) After setting the position, click the Refresh Key Frame button.

5) Click the Replay Motion button to check the motion.

6) Click the Save to File button to save the modified motion.

(4) Modifying the Time of the Created Motion
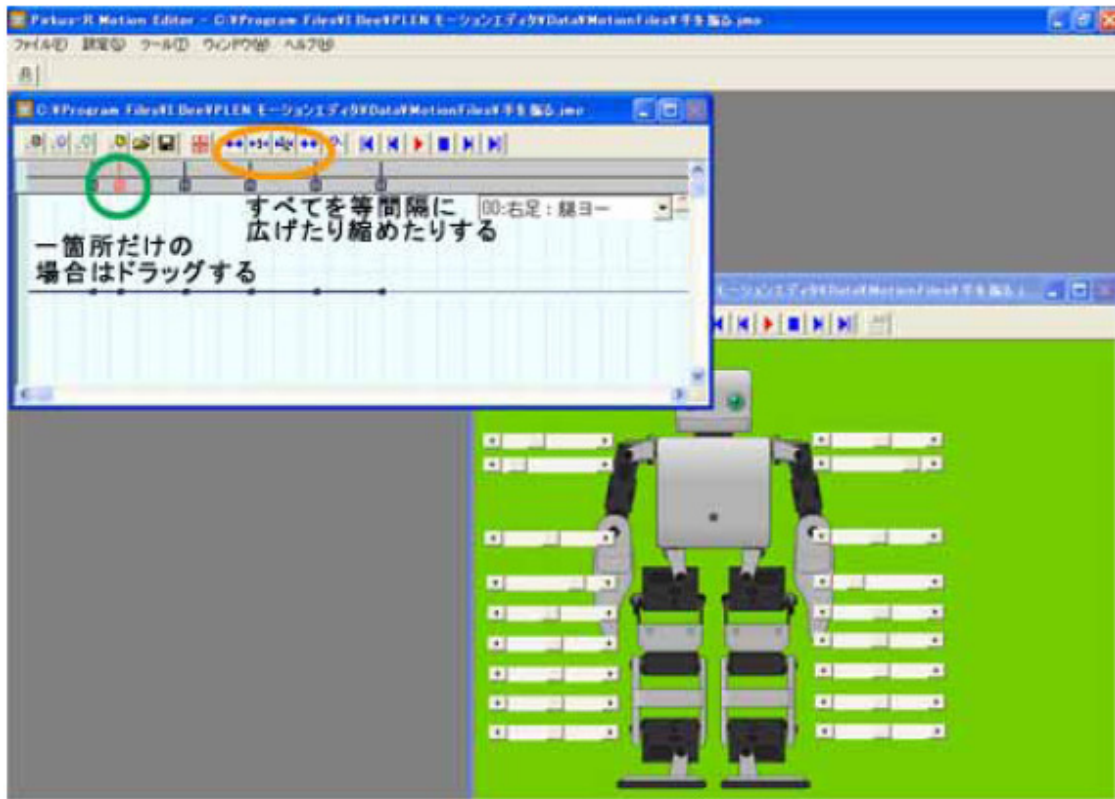
1) To expand/shrink all key frames to the same interval, click the Time buttons
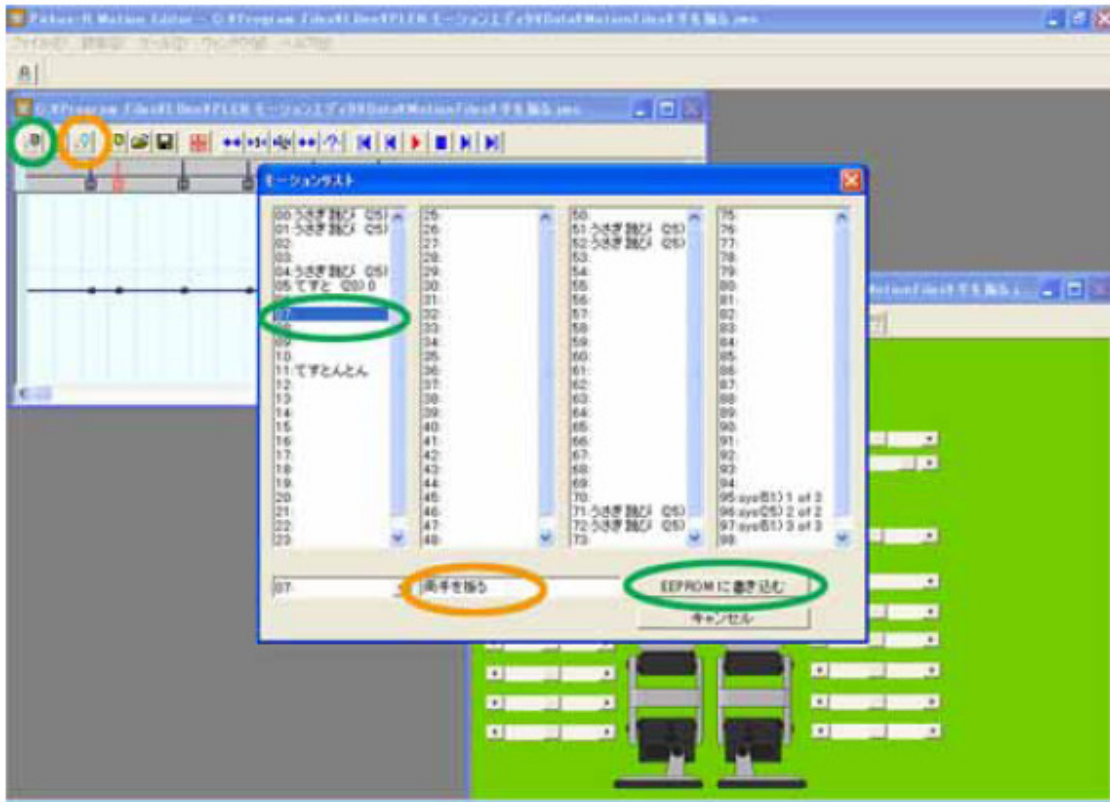
 to adjust them to desired interval.

2) To expand/shrink a certain key frame, drag the marker for the targeted key frame to adjust it to desired interval.

3) Click the Replay Motion button to check the motion.

4) Click the Save to File button to save the modified motion.

(5) Register the Created Motion to the Robot

1) Click the Register into EEPROM button ![button] to display the motion list window.

2) Select the number of the motion to be registered and then type the name for the motion in the blank box below the list.

3) Click the Write to EEPROM button on the right below to register the motion.
If the motion is registered successfully, the following message will be shown.

4) Click the Motion List button ![button] to display the motion list and check to see the motion has been registered.

To manipulate with a Bluetooth compatible mobile phone or the other Bluetooth device by air, it is necessary to upload motions to the PLEN according to the procedure described above.

The figure above shows the PLEN motion list that we use to demonstrate the function of the PLEN. When you upload motions to your PLEN, please refer to this list.

All of the motion names are not shown in the above figure, so we will list all of them in the following:.

00: Throw a box forward

01: One step forward

02: Throw a box sideward

03: Move to the left

04: Lift up a box

05: Move to the right

06: Move to the Left

07: One step backward

08: Move to the right

09: Put a box

10: Throw a box forward

11: One step forward while holding a box

12: Throw a box sideward

13: Turn to the left while holding a box

14: Four steps forward while holding a box

15: Turn to the right while holding a box

16: Move to the left while holding a box

17: Four steps backward while holding a box

18: Move to the right while holding a box

19: One step backward while holding a box

20: Skate to the left (The motion name of the supplied motion is "Roller skate to the left)

21: Raise up the right leg

22: Skate to the right (The motion name of the supplied motion is "Roller skate to the right)

23: Accelerate to the left

24: Brake

25: Accelerate to the right

26: Skate to the backward left (The motion name of the supplied motion is "Roller skate to the backward left)

27: Raise the right leg backward

28: Skate to the backward right (The motion name of the supplied motion is "Roller skate to the backward right)

29: Back brake

30: Stand up from lying face up with roller skates

31: Stand up from lying face down with roller skates

32: T-shape balance

In the numbers 75-86, the motions are set to be controlled by the cursor key of a Bluetooth compatible mobile phone.
The motion data for cursor control are stored in "C:¥Program Files¥I Bee¥PLEN モーションエディタ¥Data¥MotionFiles¥カーソル操作用¥行歩."

75: Start to walk forward

76: Walking forward

77: Stop to walk forward

78: Start to walk backward

79: Walking backward

80: Stop to walk backward

81: Start to turn to the right

82: Turning to the right

83: Stop to turn to the right

84: Start to turn to the left

85: Turning to the left

86: Stop to turn to the left

If the transfer of the motion fails or the motion list is not displayed normally, press the connection button of the PLEN MotionEditor to disconnect and then press the connection button to establish the connection again.

The connection will be normally established again and it will become possible to transfer the motion and display the motion list.

V. Contact

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