Introduction to Distributed and Embedded Multi-agent Systems

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Nilson Mori Lazarin[1,2]

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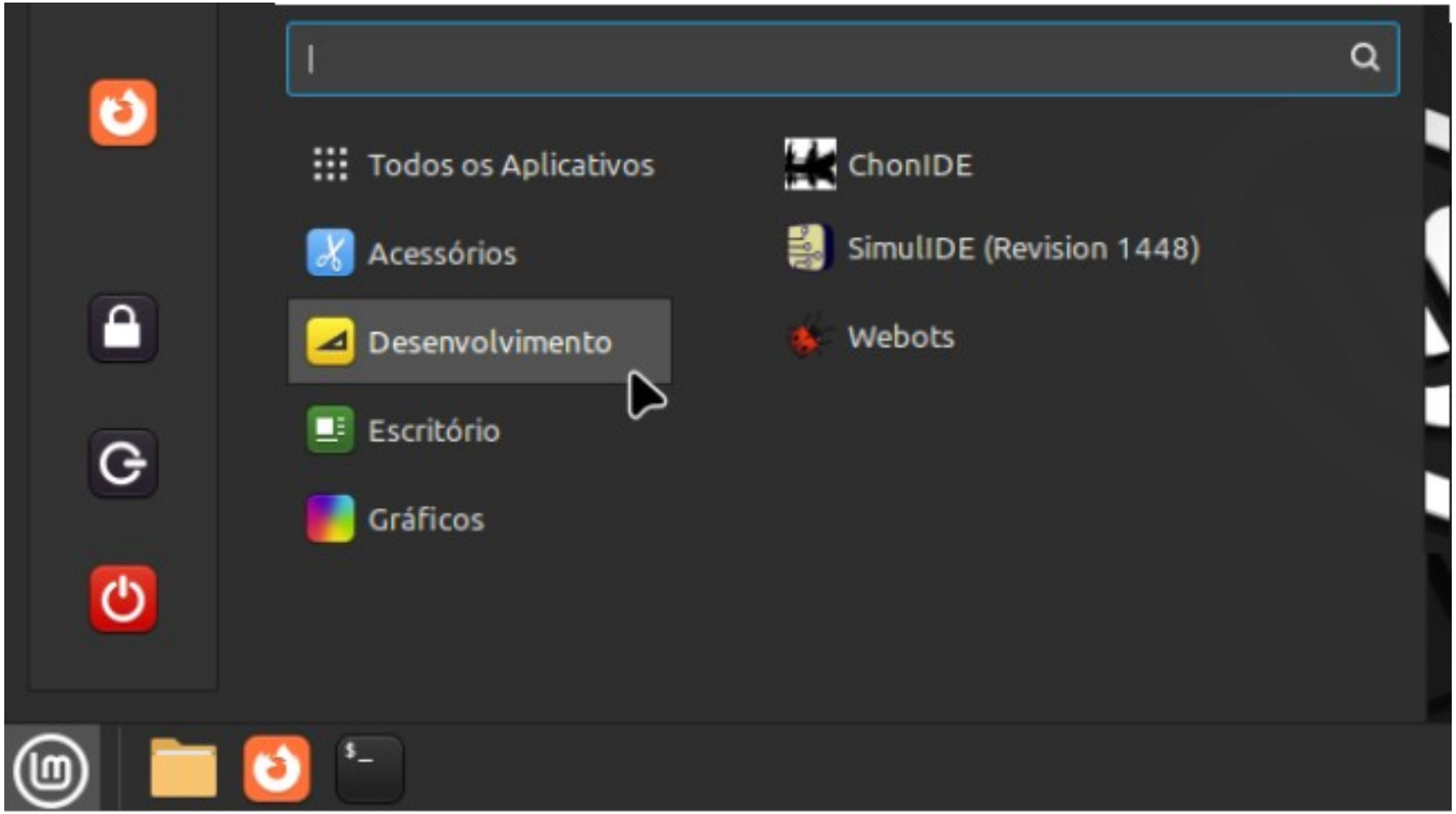
Fevereiro 2024

THE DEVELOPMENT TOOLS

ChonIDE

Souza de Jesus, V., Mori Lazarin, N., Pantoja, C.E., Vaz Alves, G., Ramos Alves de Lima, G., Viterbo, J. (2023). An IDE to Support the Development of Embedded Multi-Agent Systems. In: Mathieu, P., Dignum, F., Novais, P., De la Prieta, F. (eds) Advances in Practical Applications of Agents, Multi-Agent Systems, and Cognitive Mimetics. The PAAMS Collection. PAAMS 2023. Lecture Notes in Computer Science(), vol 13955. Springer, Cham. https://doi.org/10.1007/978-3-031-37616-0_29



Manual de Instalação
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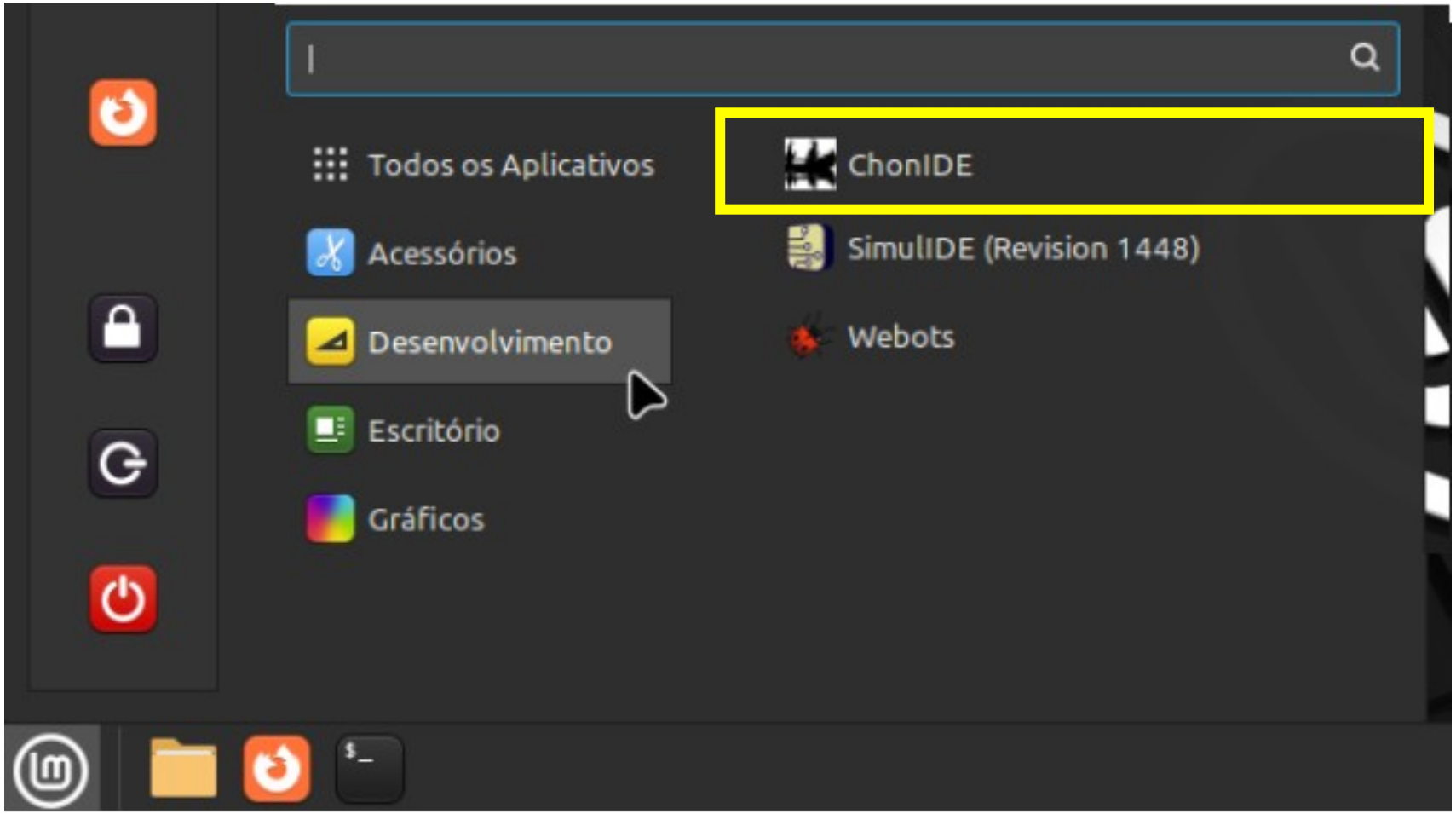

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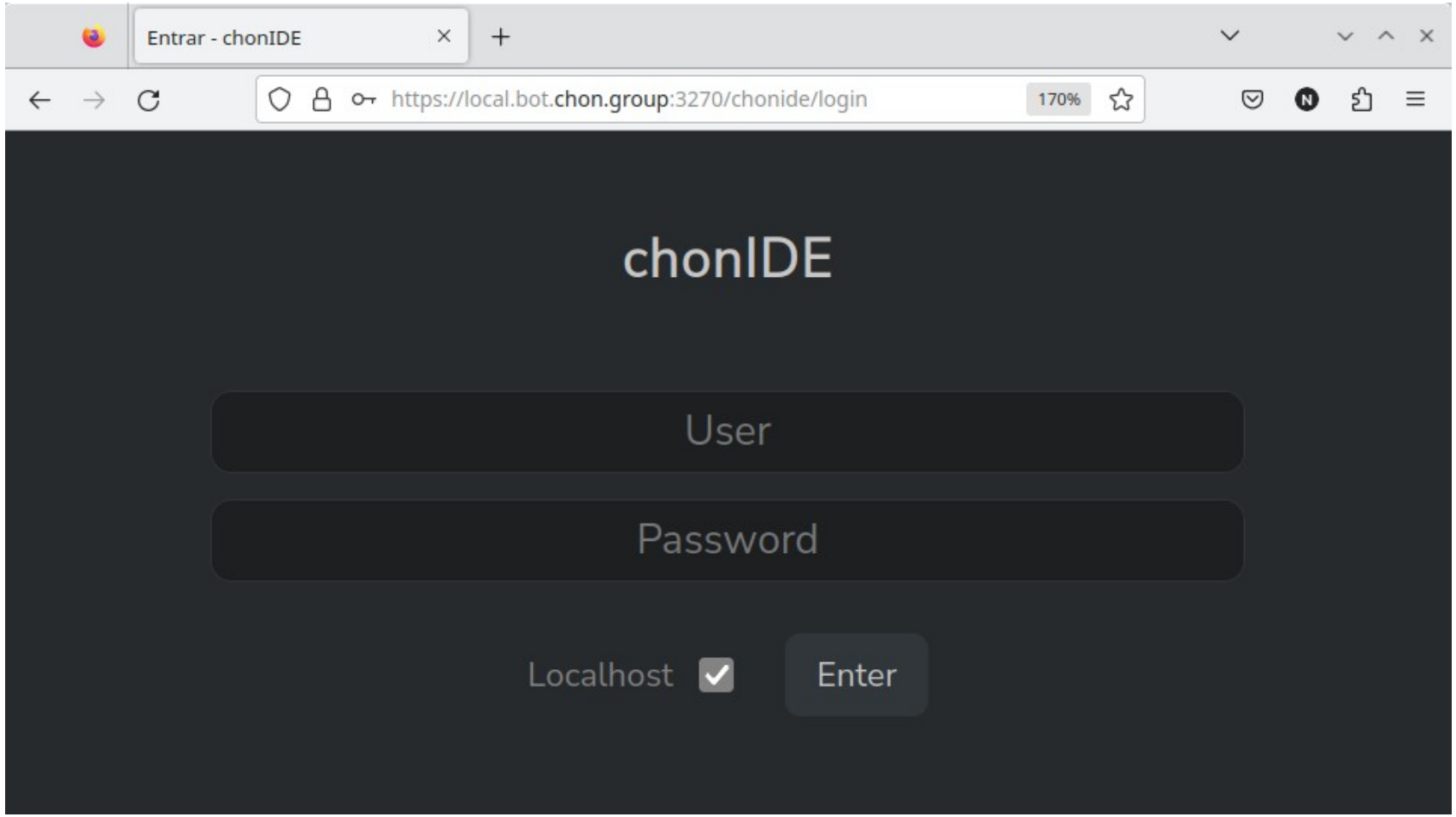
ChonIDE



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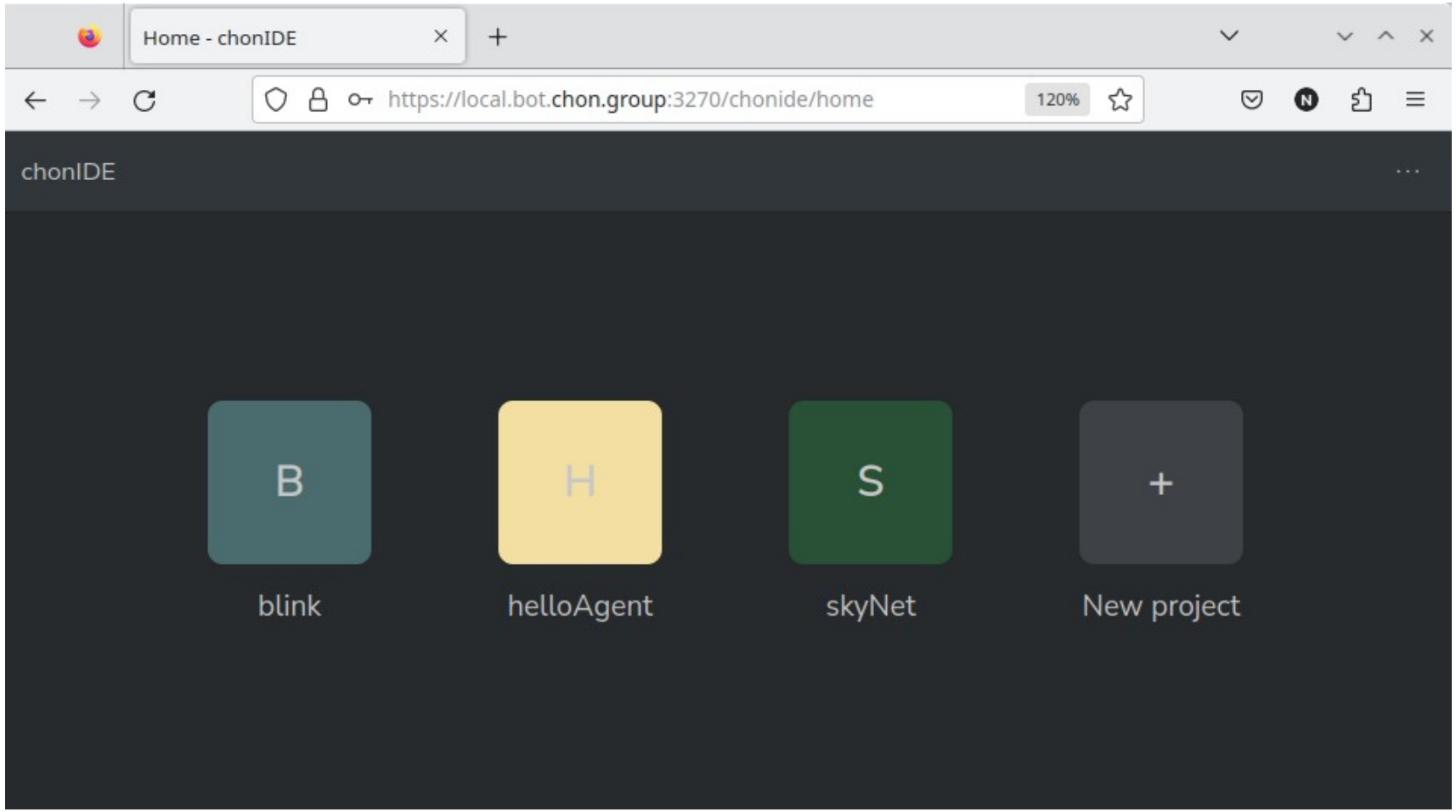

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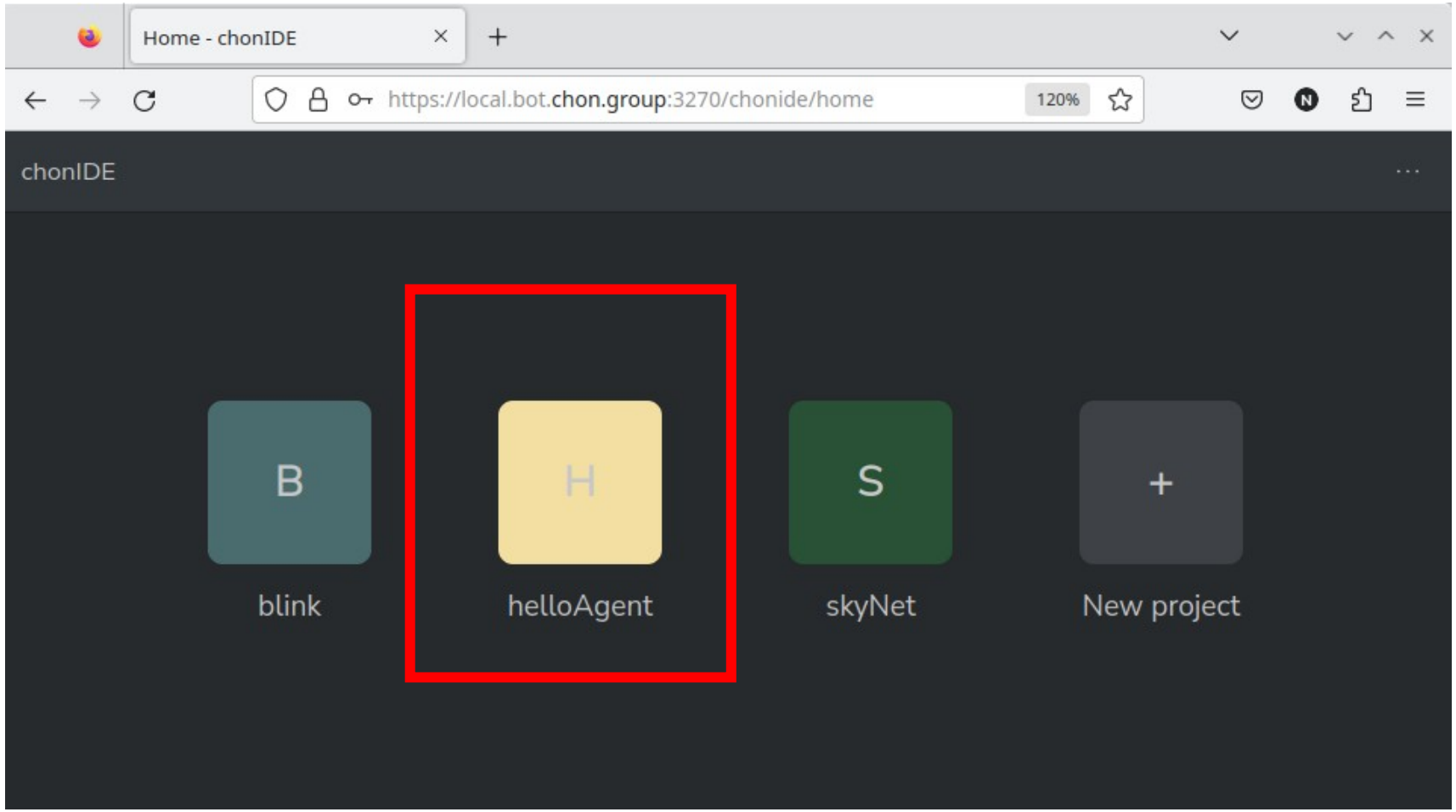

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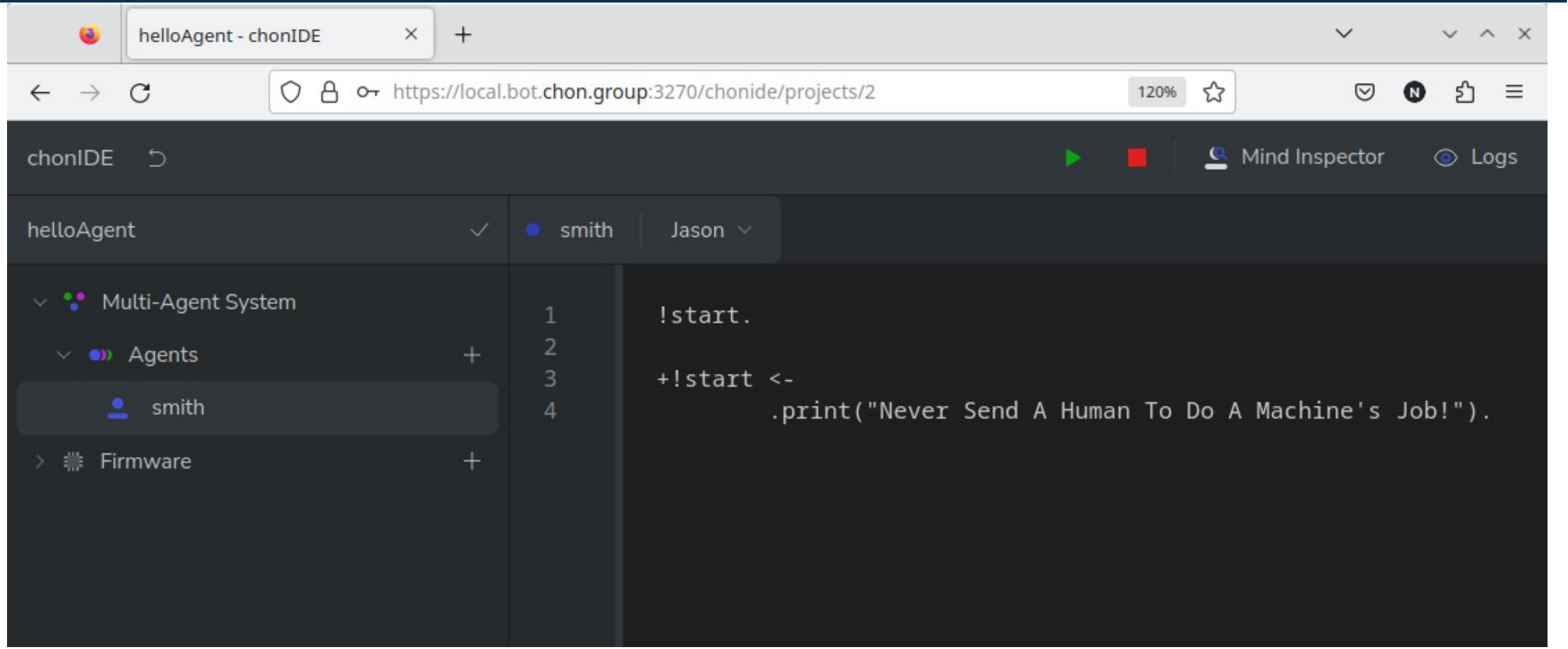

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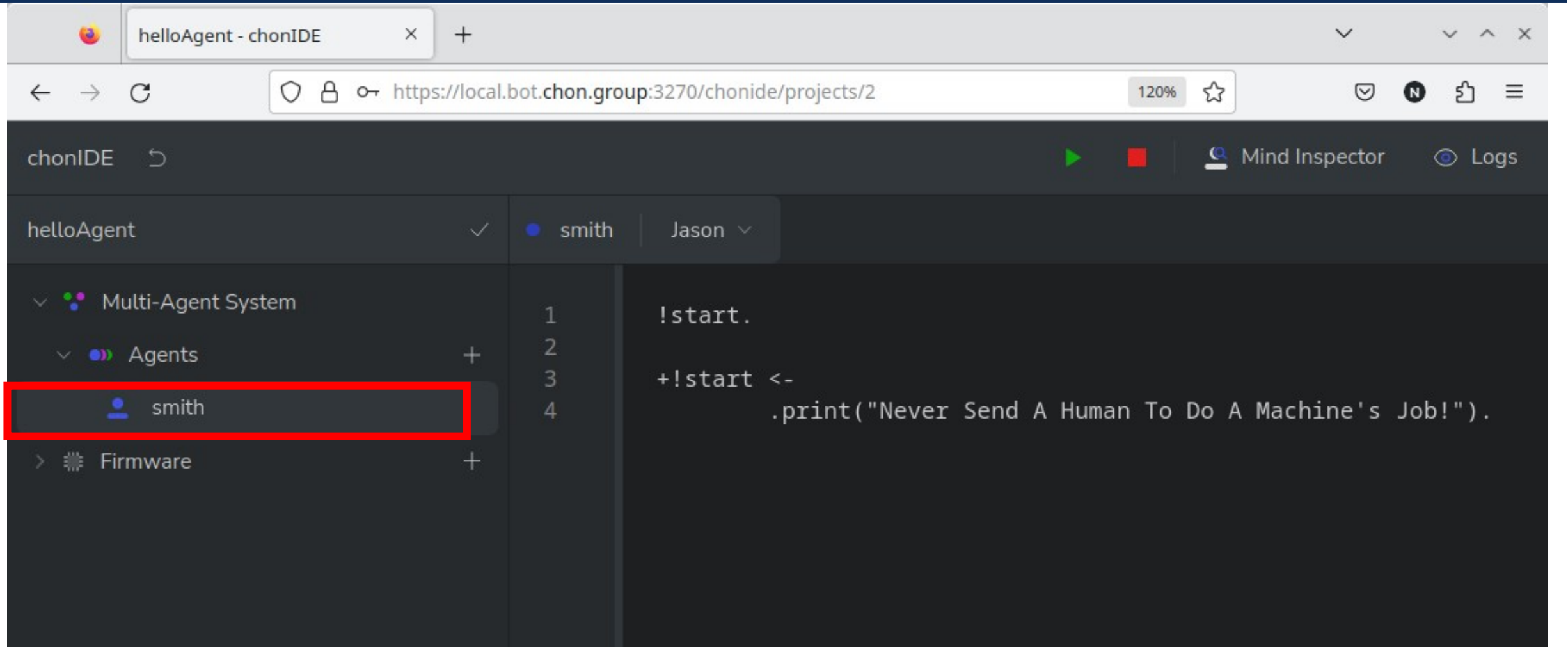

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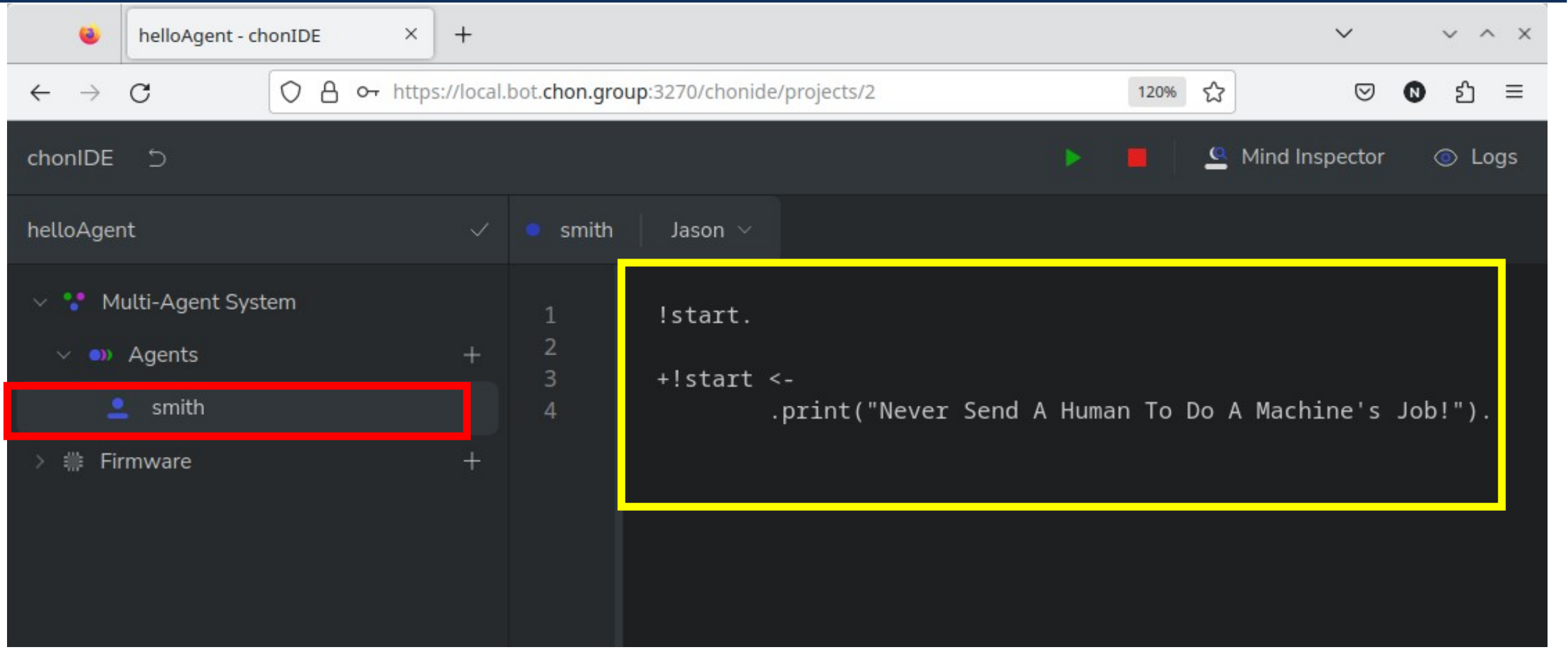

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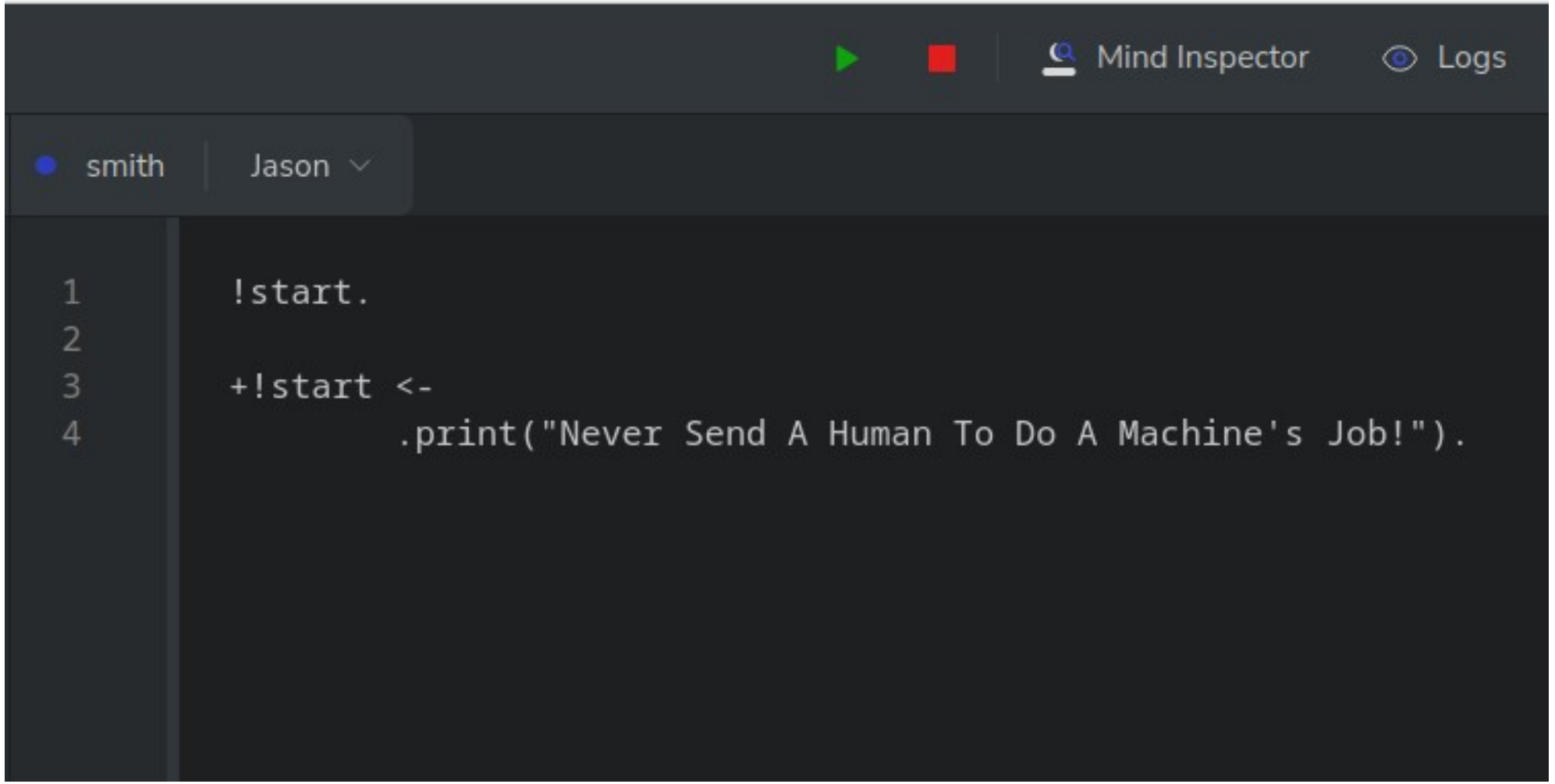

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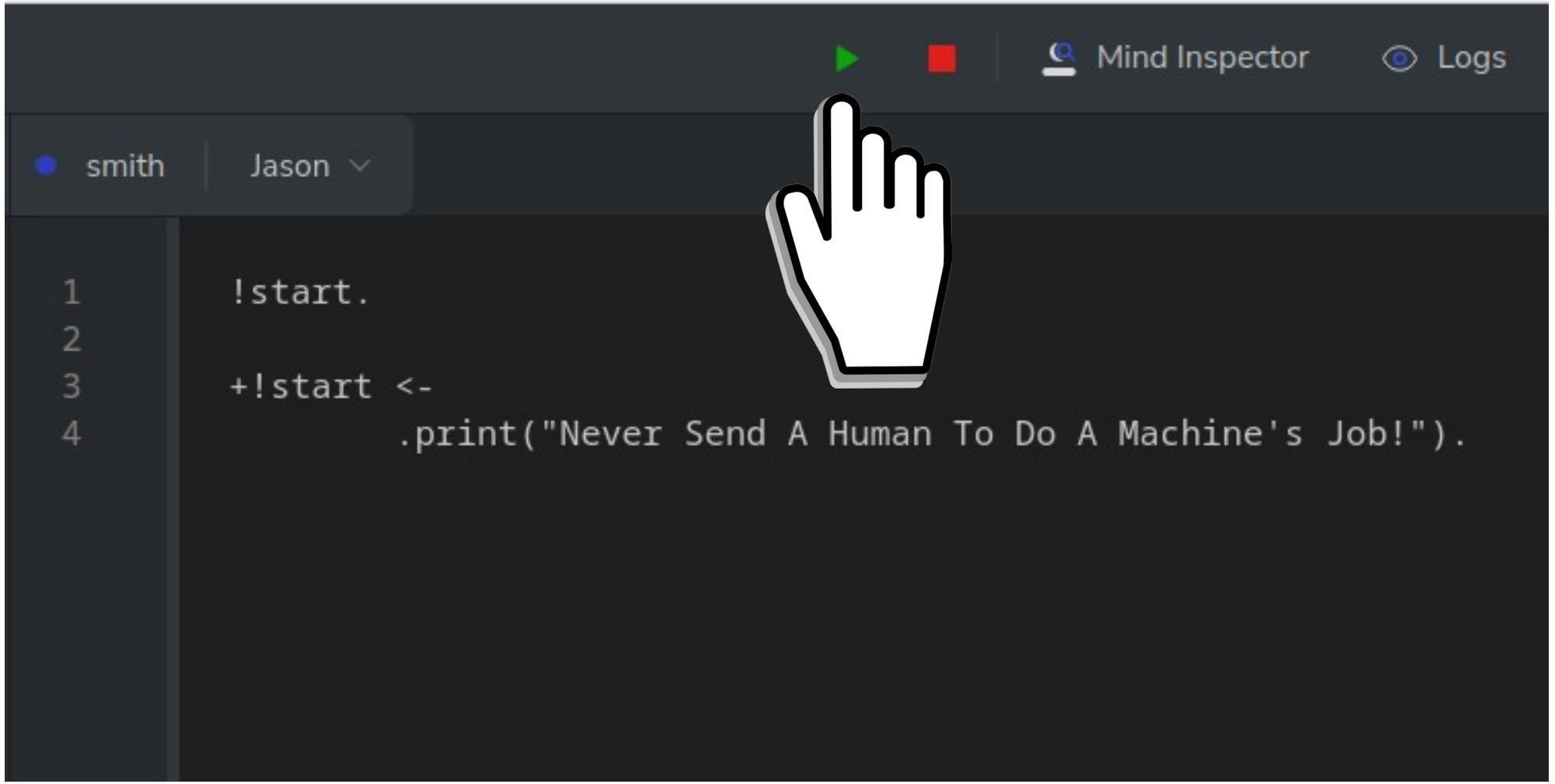

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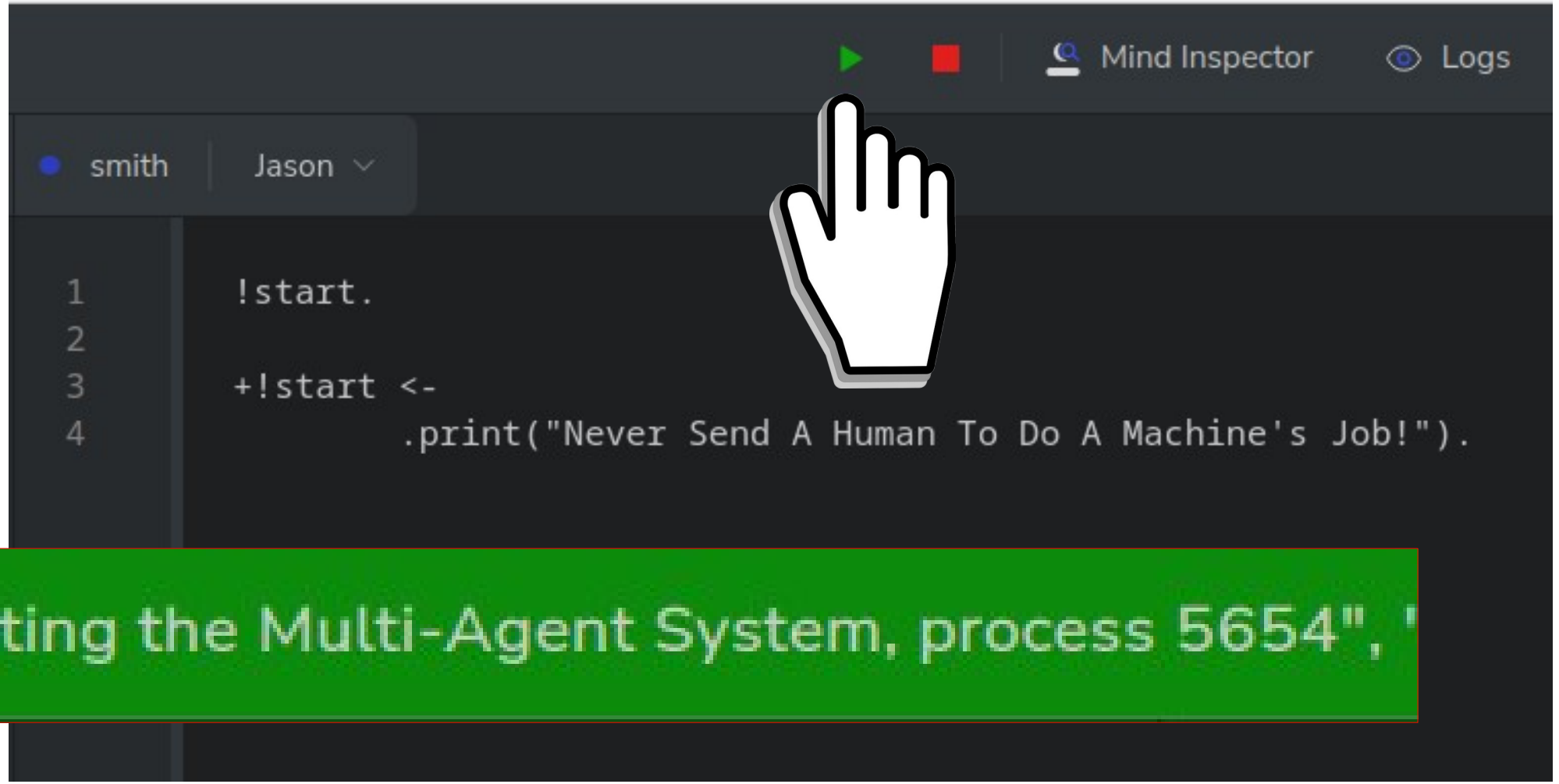

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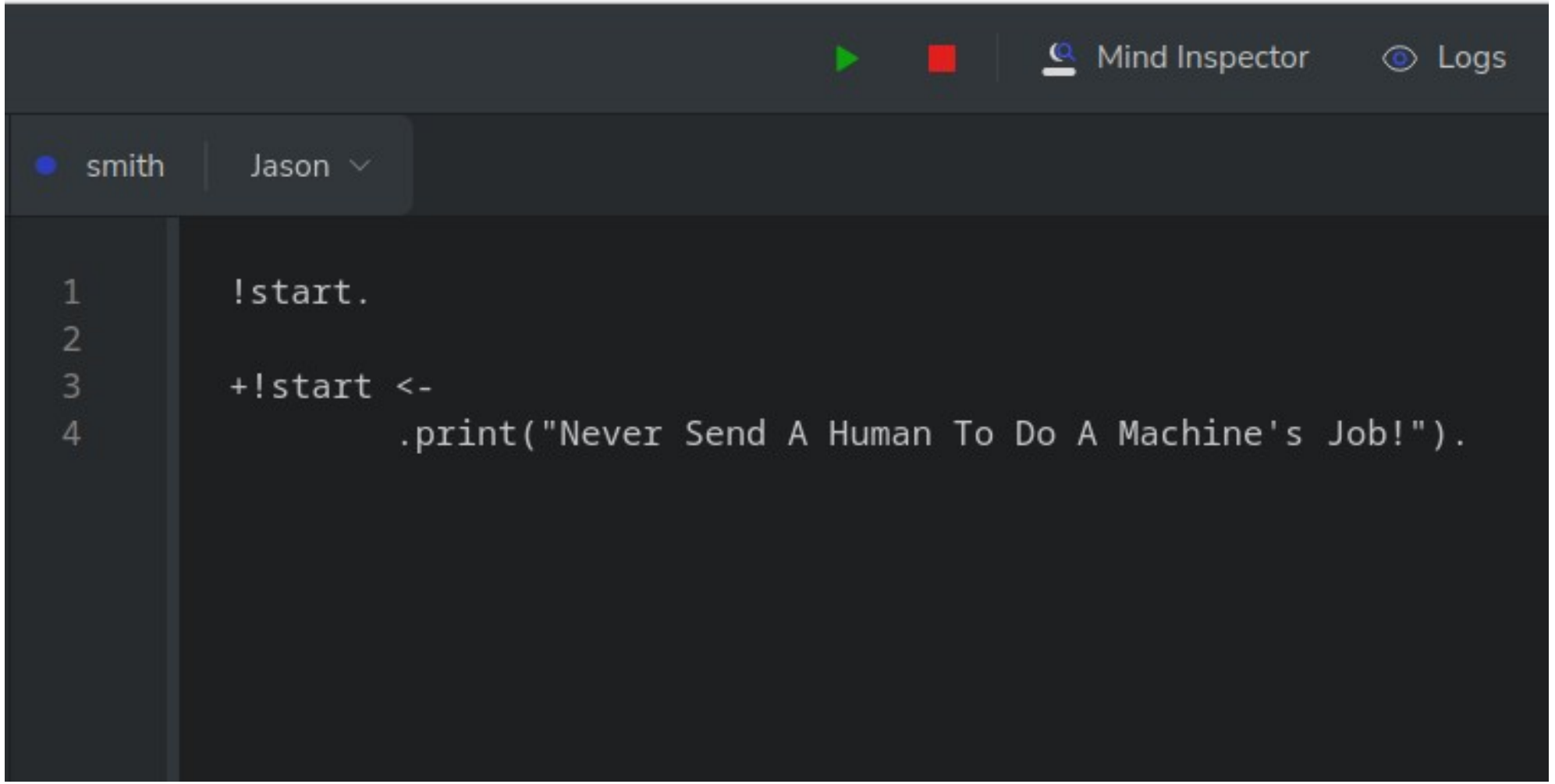

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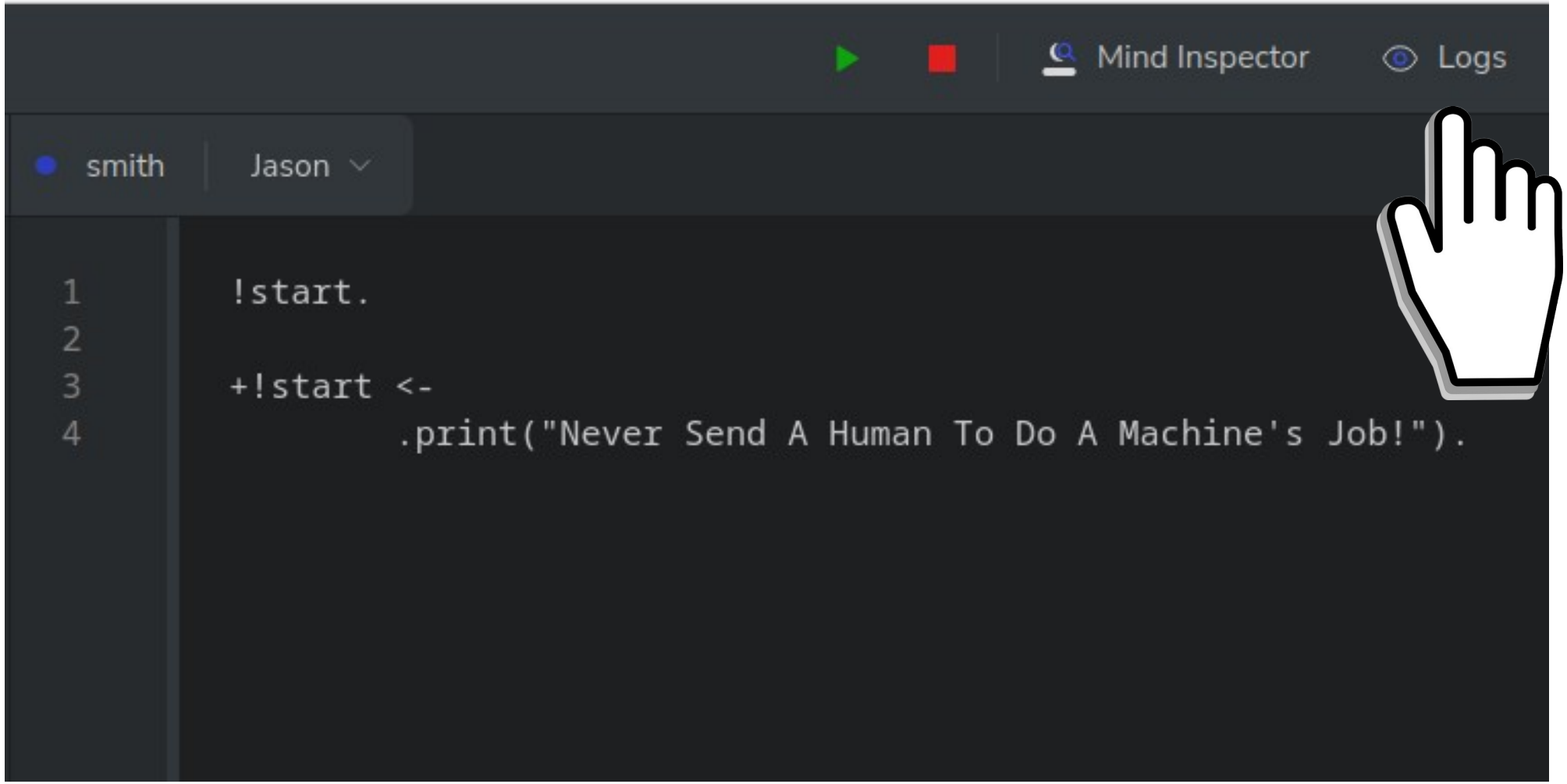

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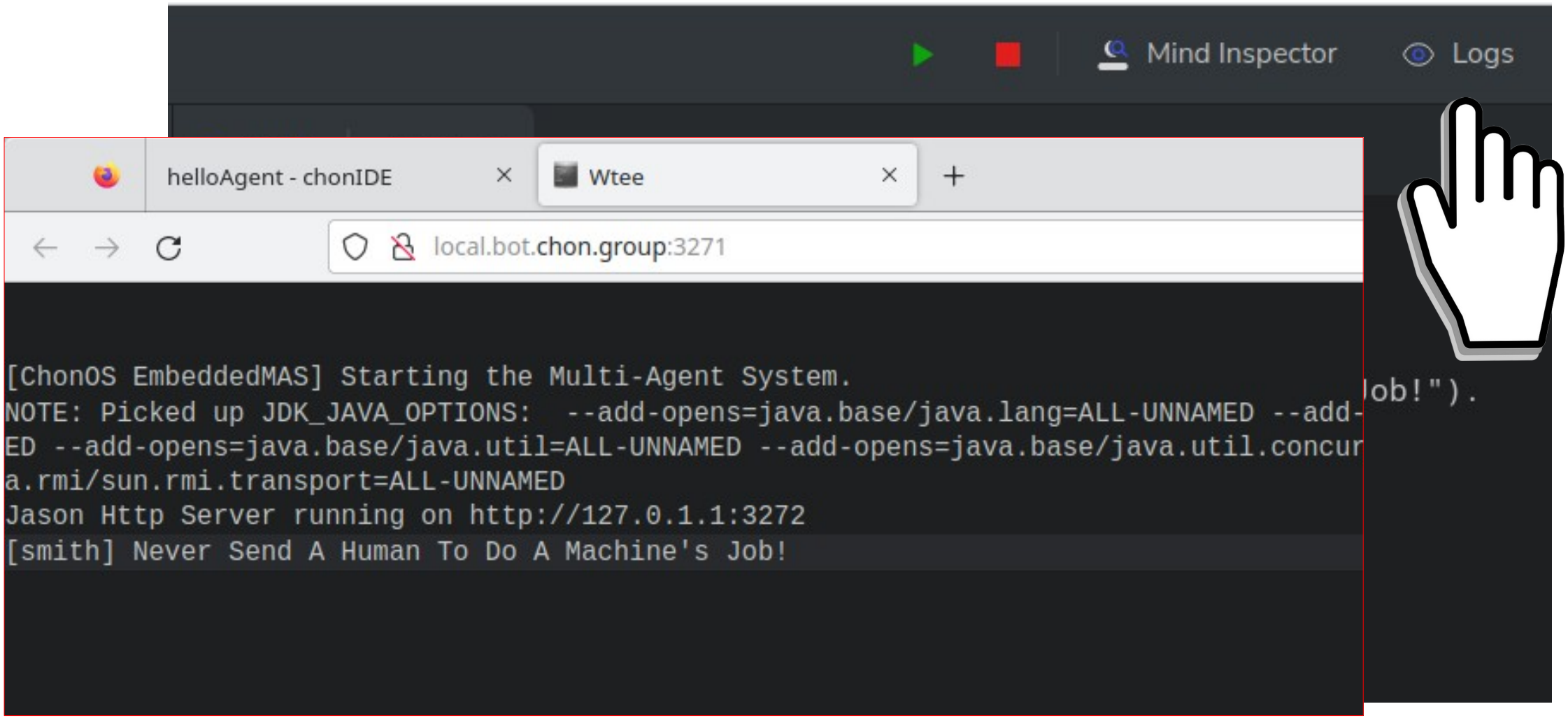

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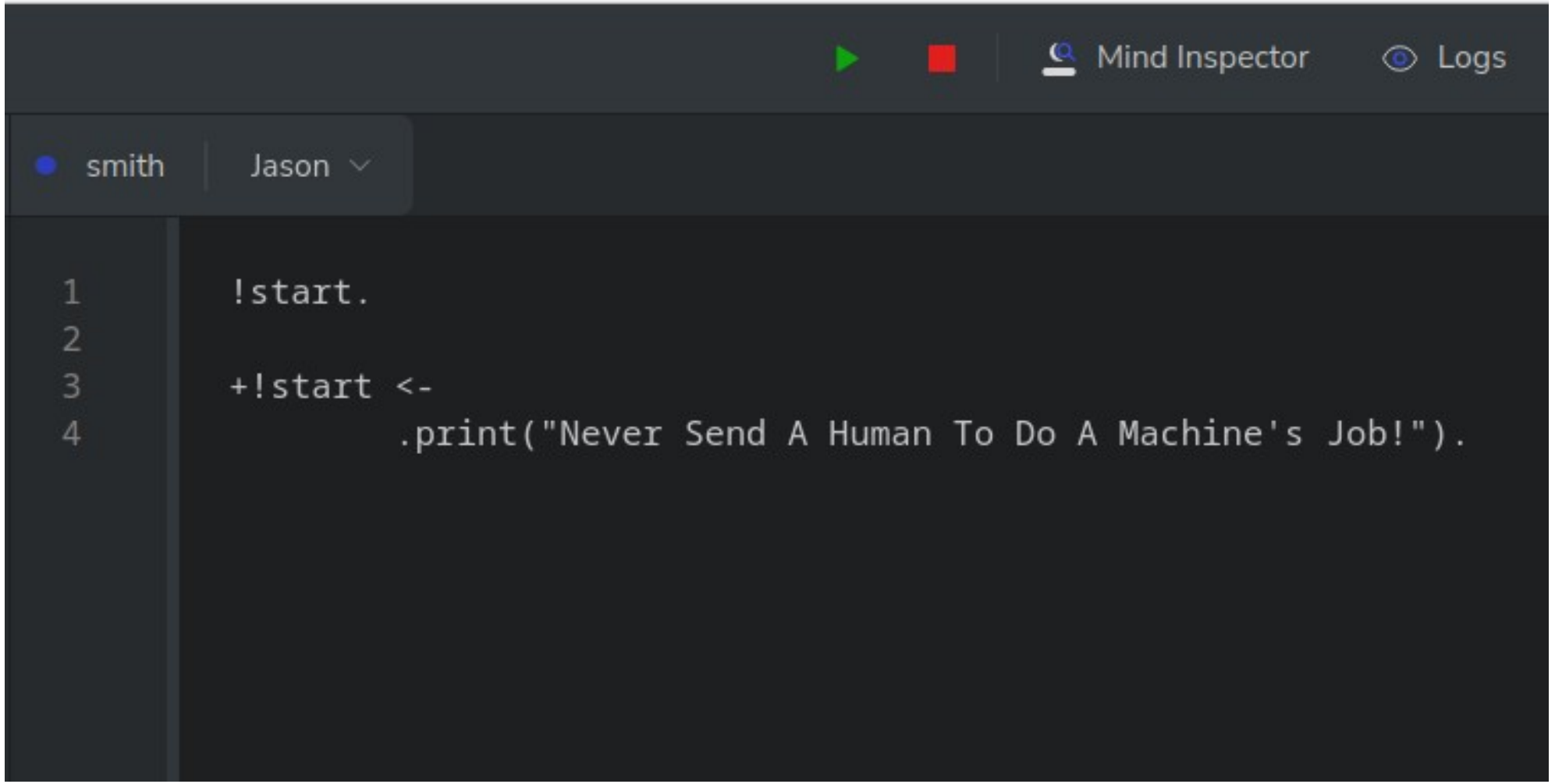

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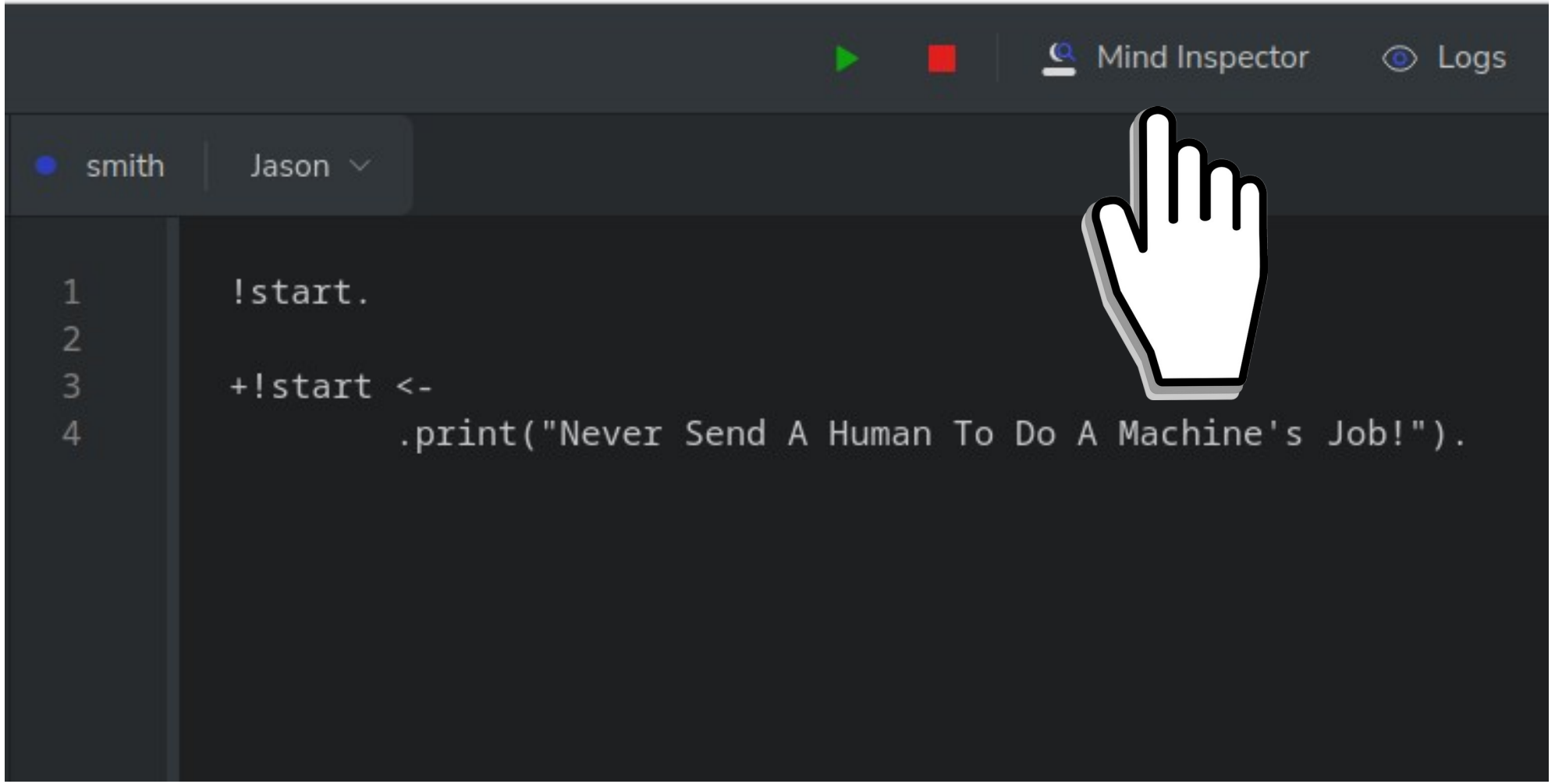

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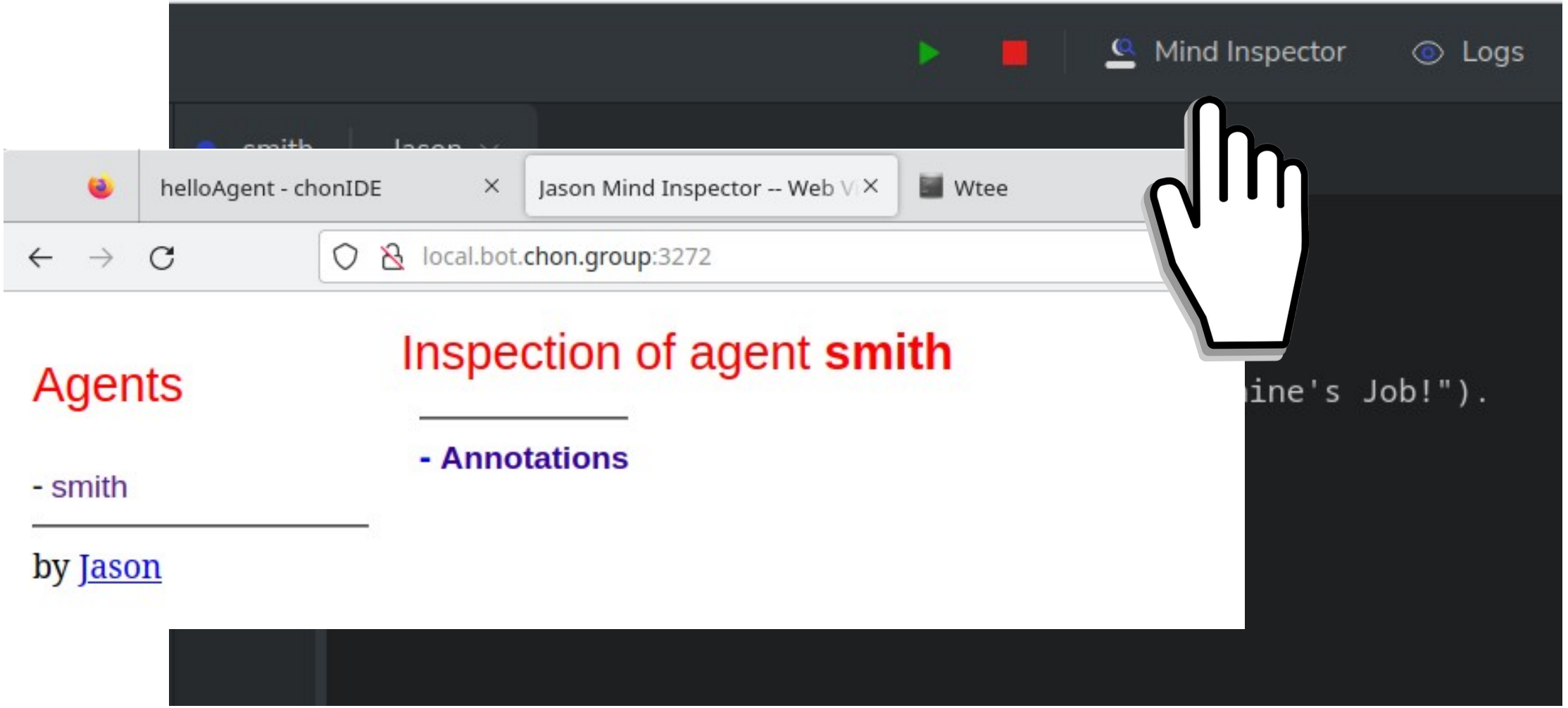

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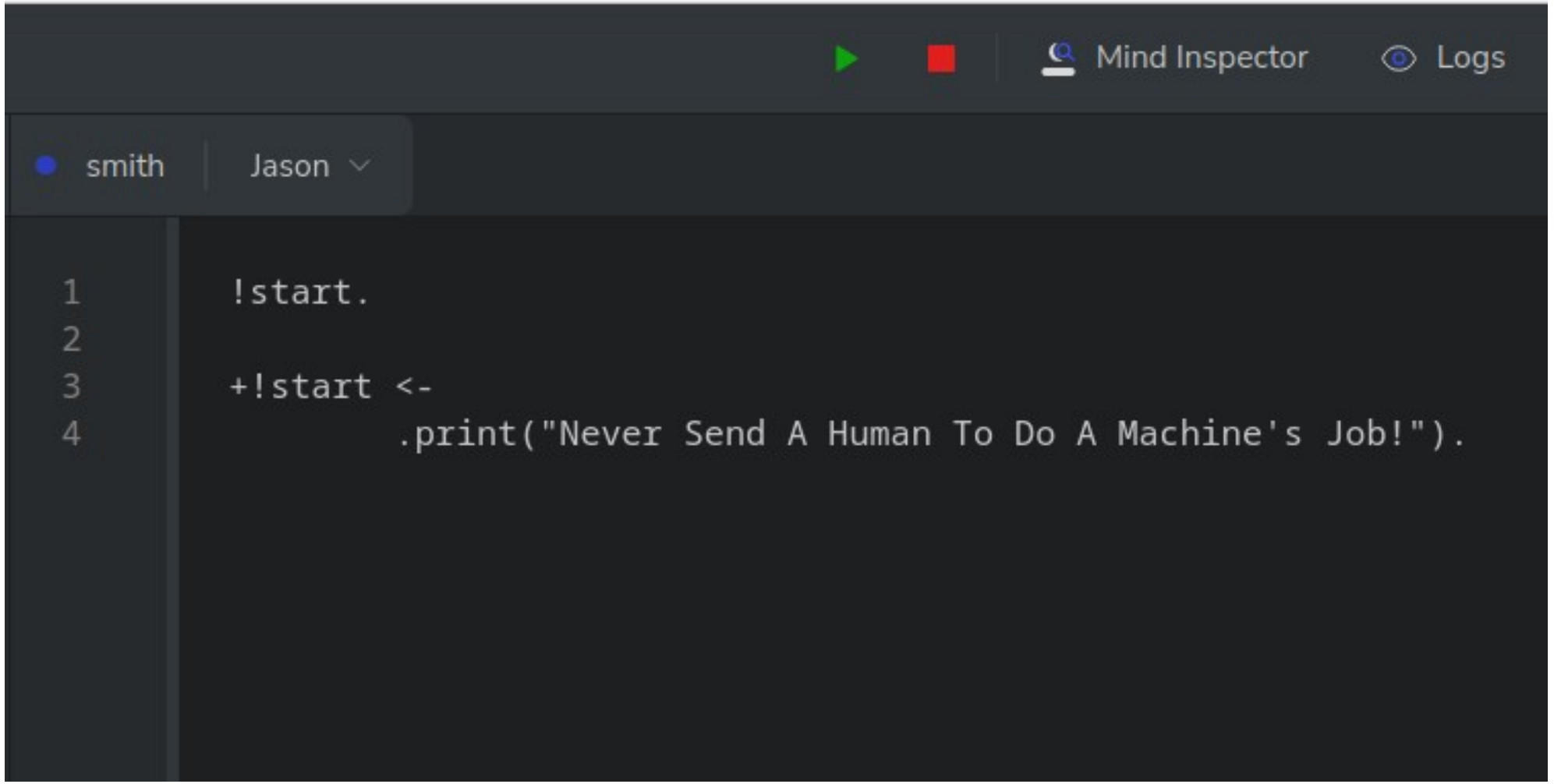

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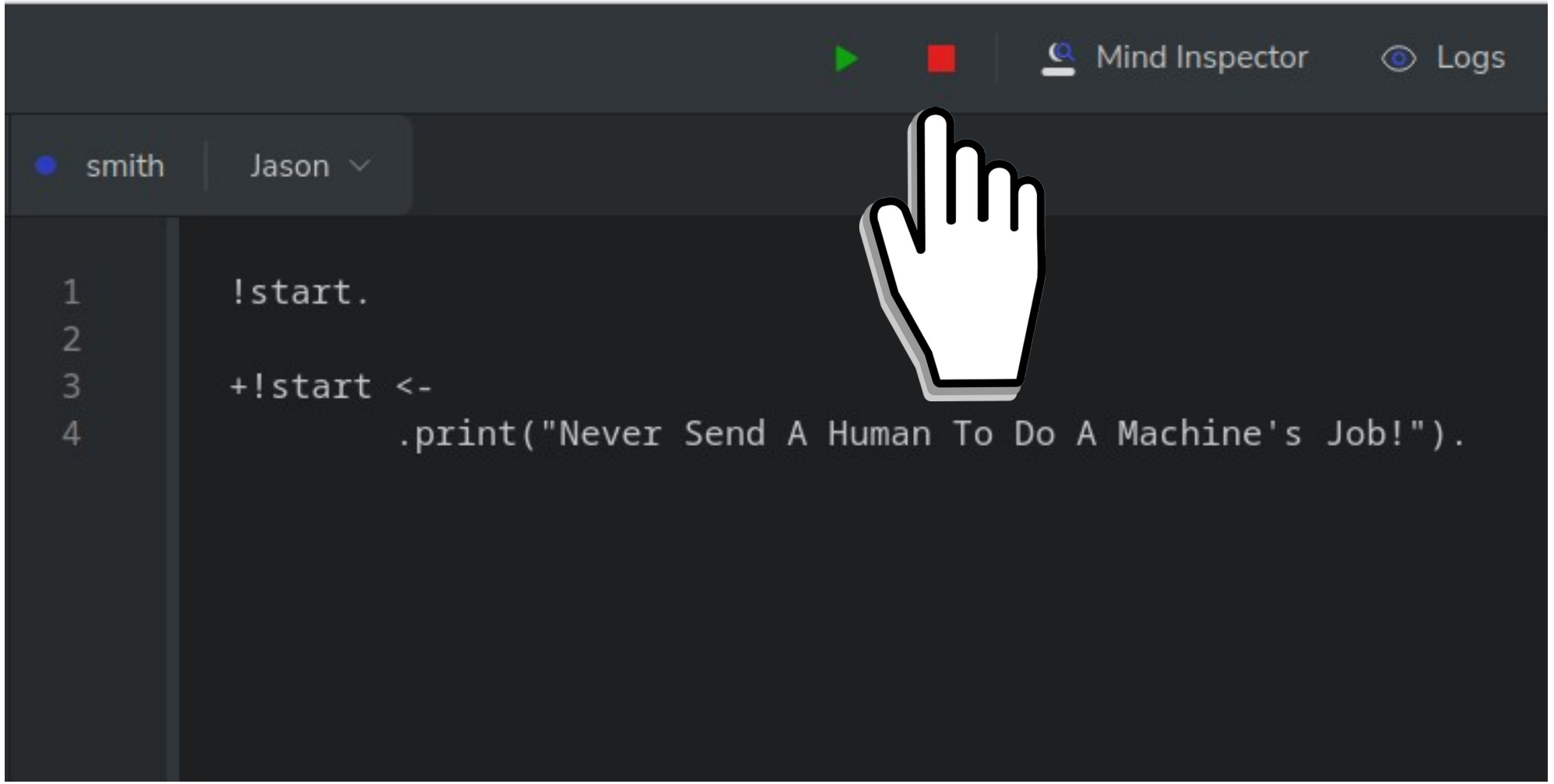

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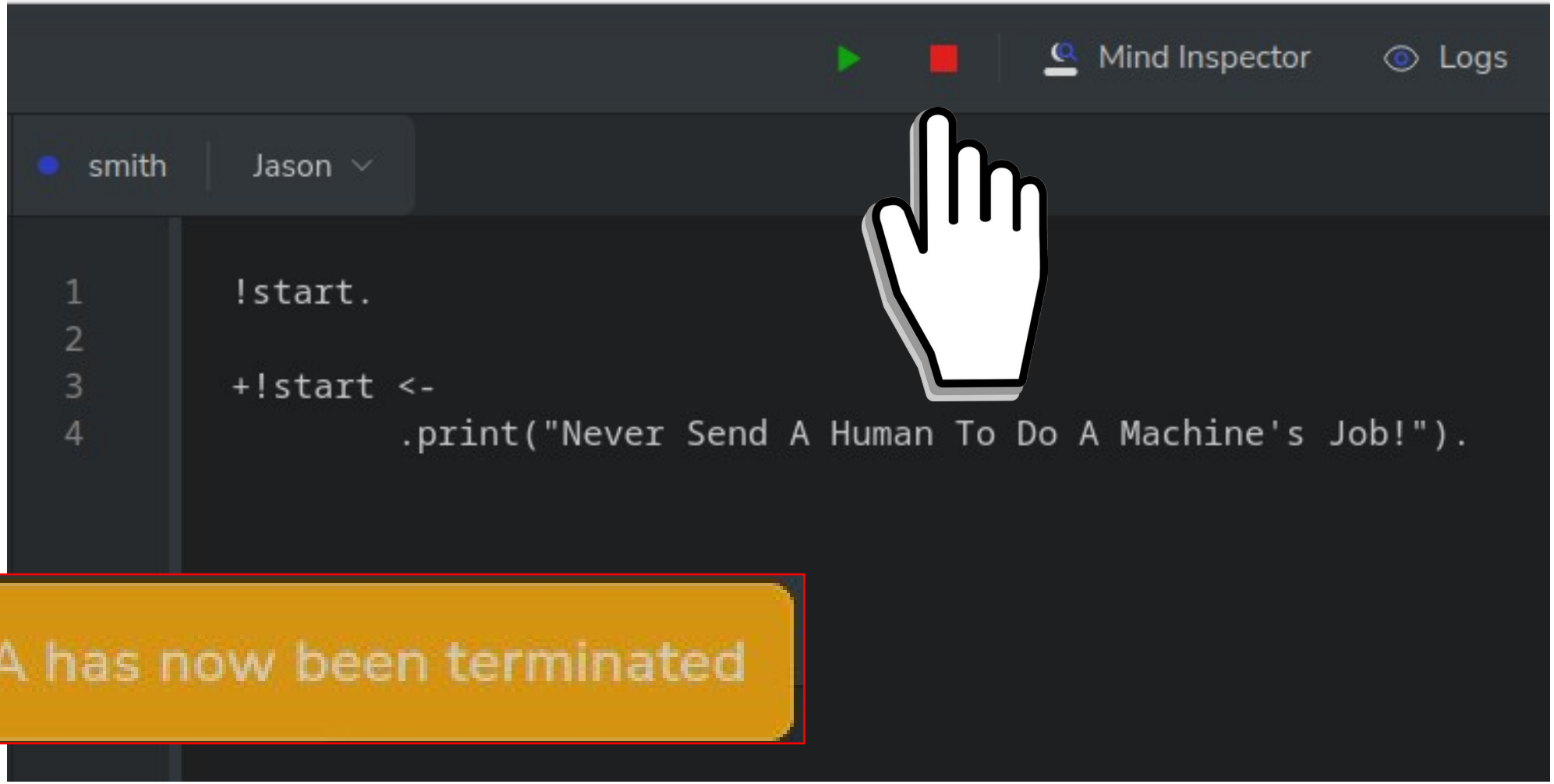

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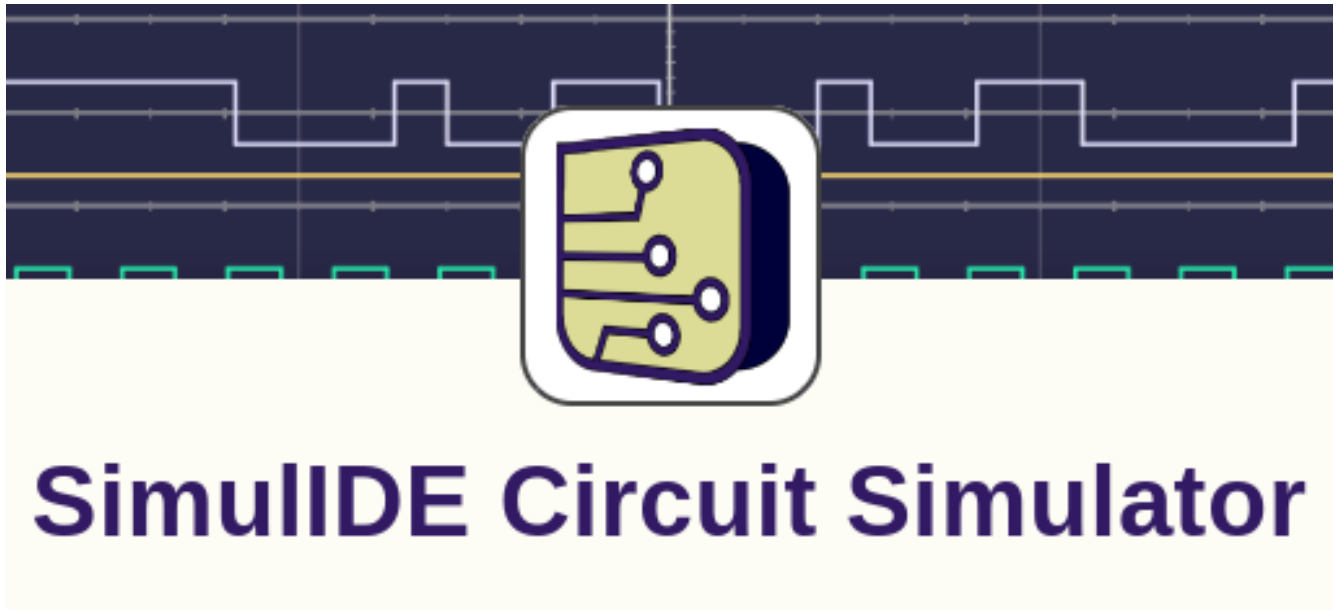
SimulIDE



González, Santiago. “SimulIDE Circuit Simulator”, 2023. https://simulide.com.

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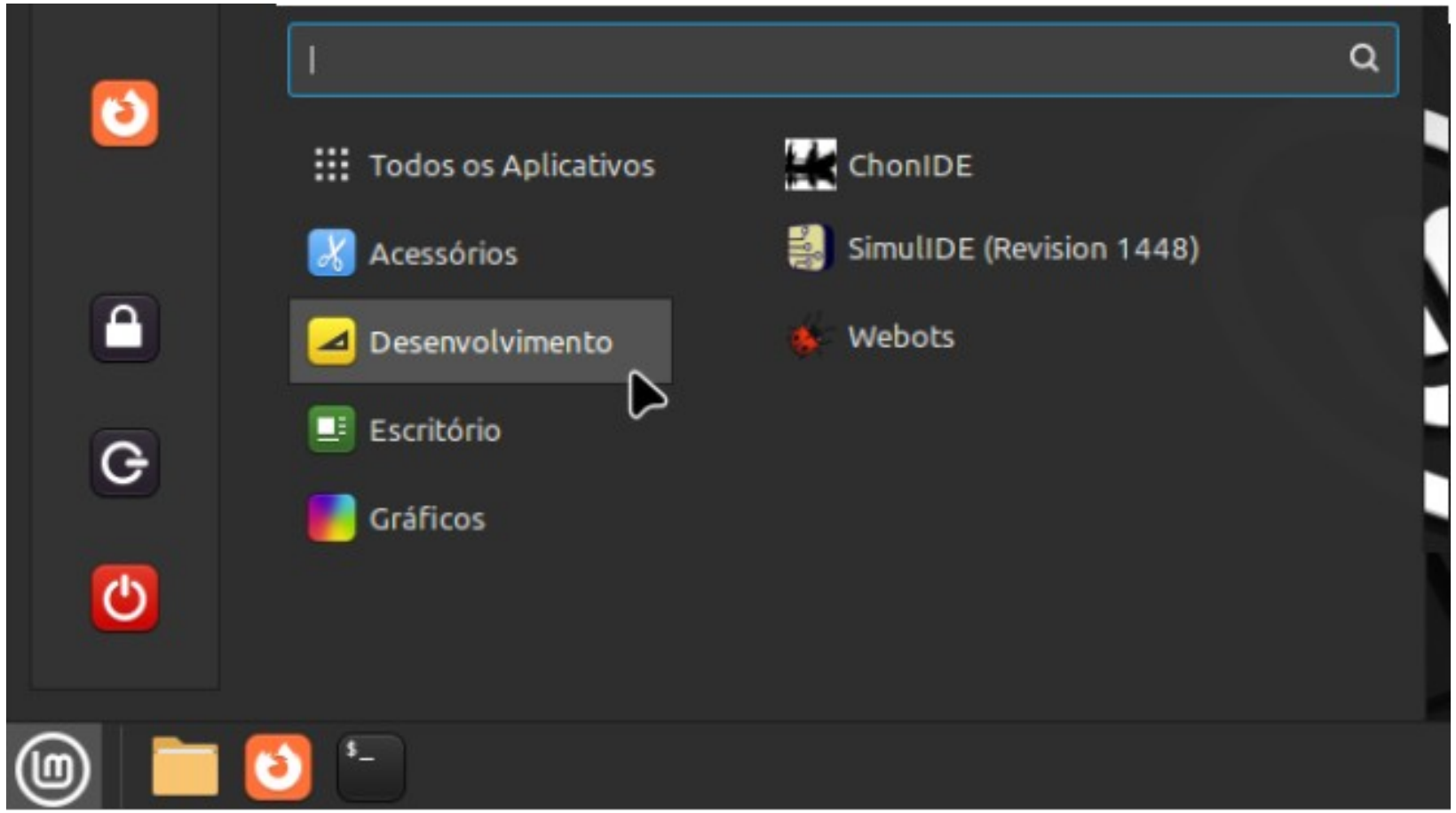

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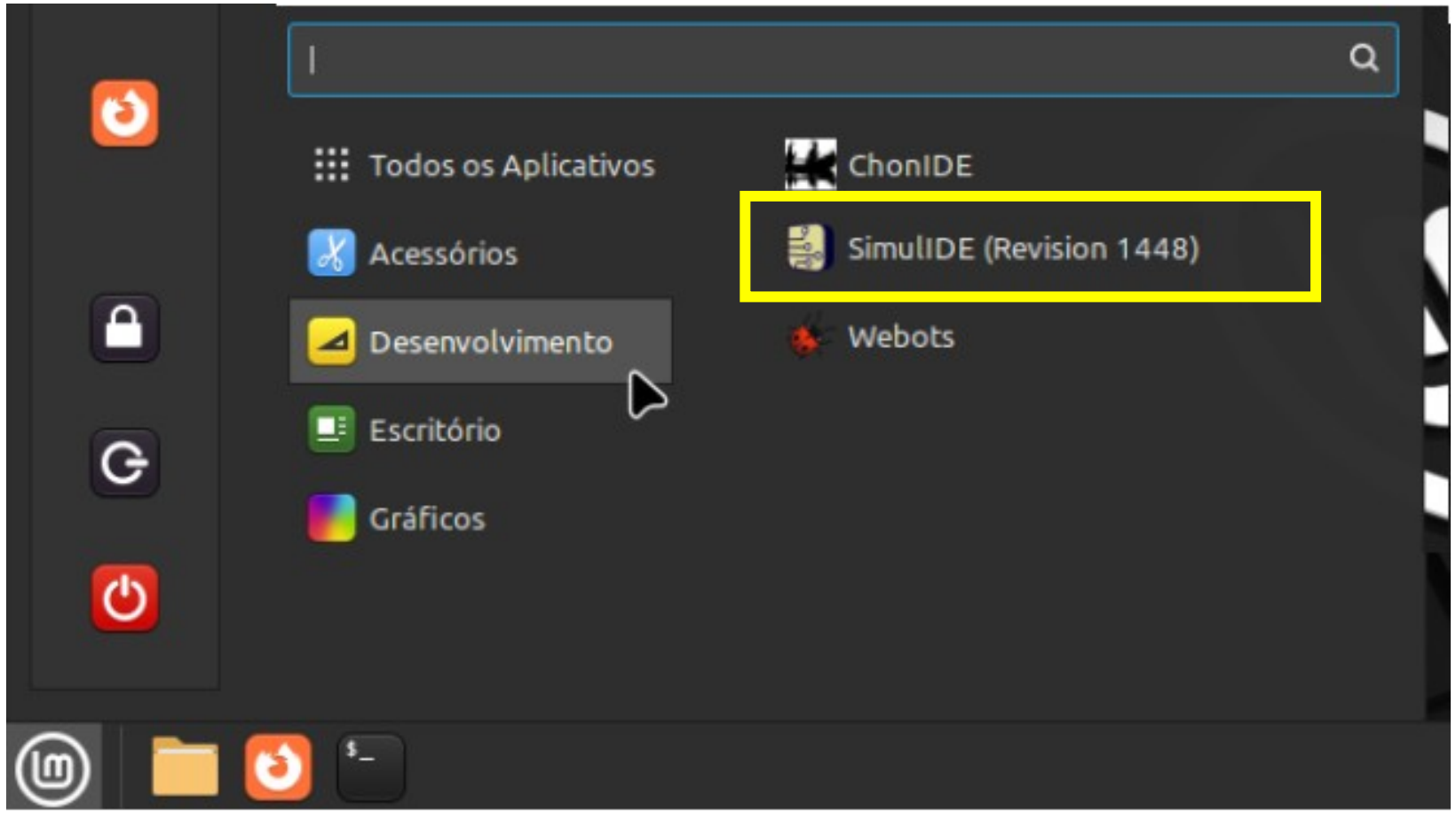

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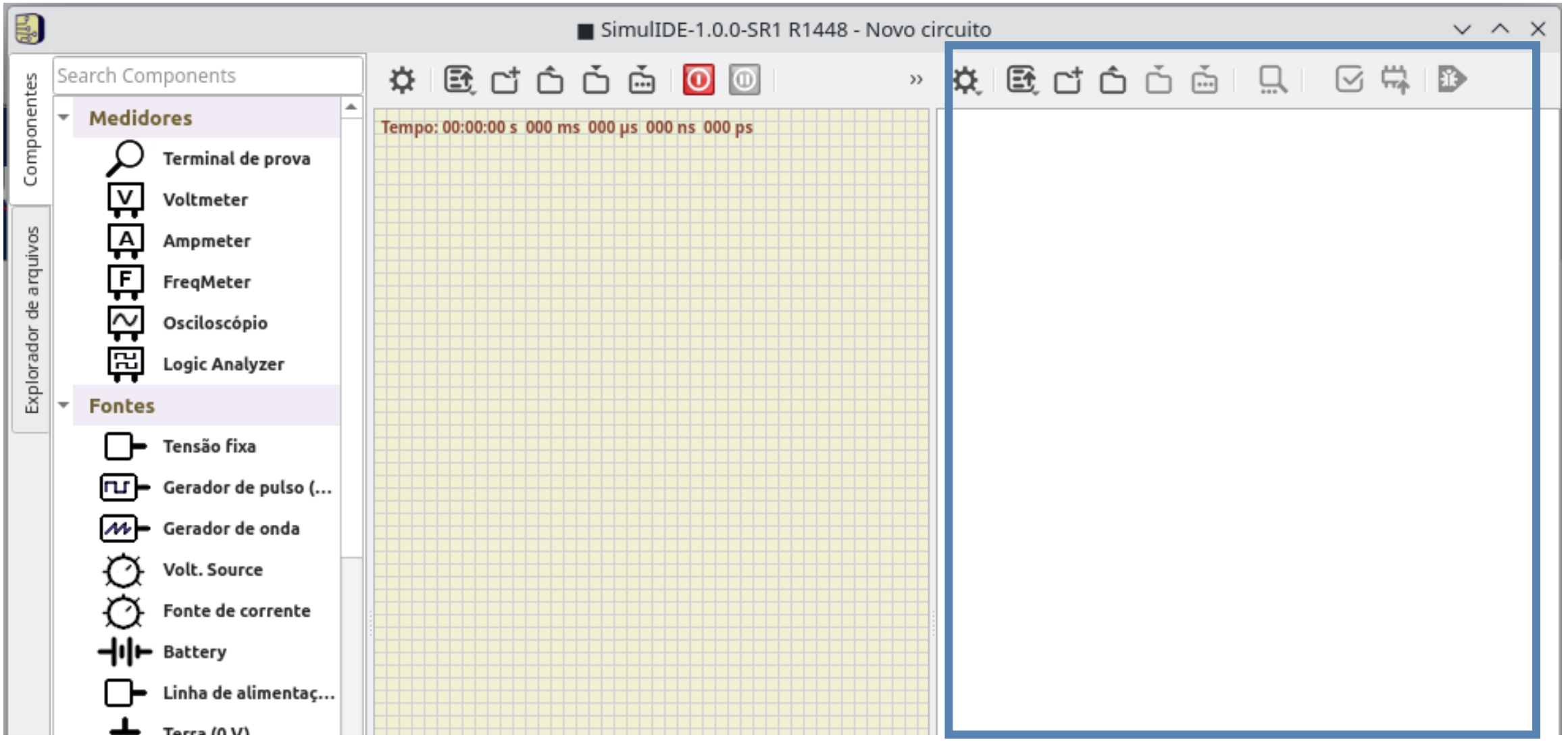
SimulIDE-1.0.0-SR1 R1448 - Novo circuito
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Explorador de arquivos
Search Components
Medidores
Terminal de prova
Voltmeter
Ampmeter
FreqMeter
Osciloscópio
Logic Analyzer
Fontes
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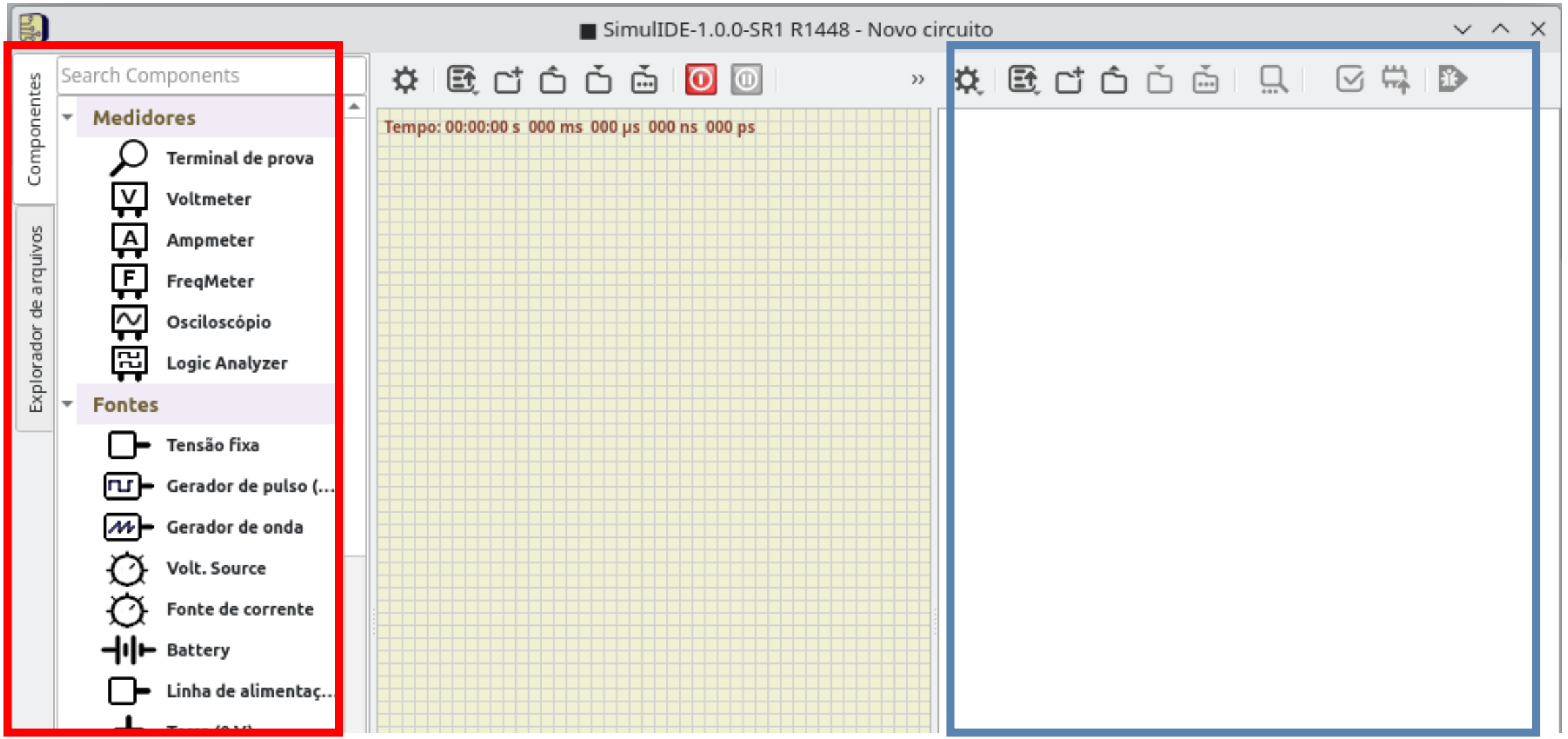
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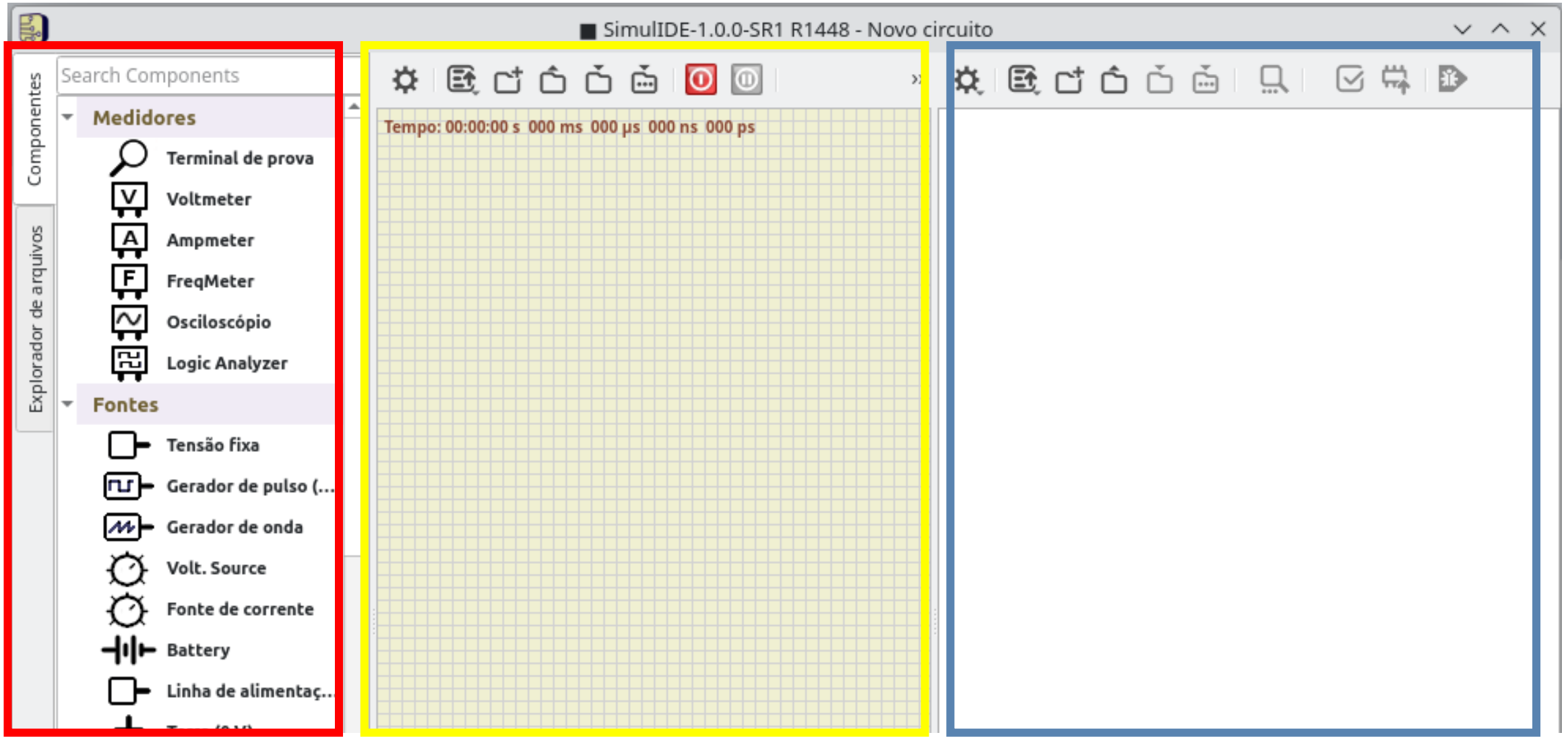
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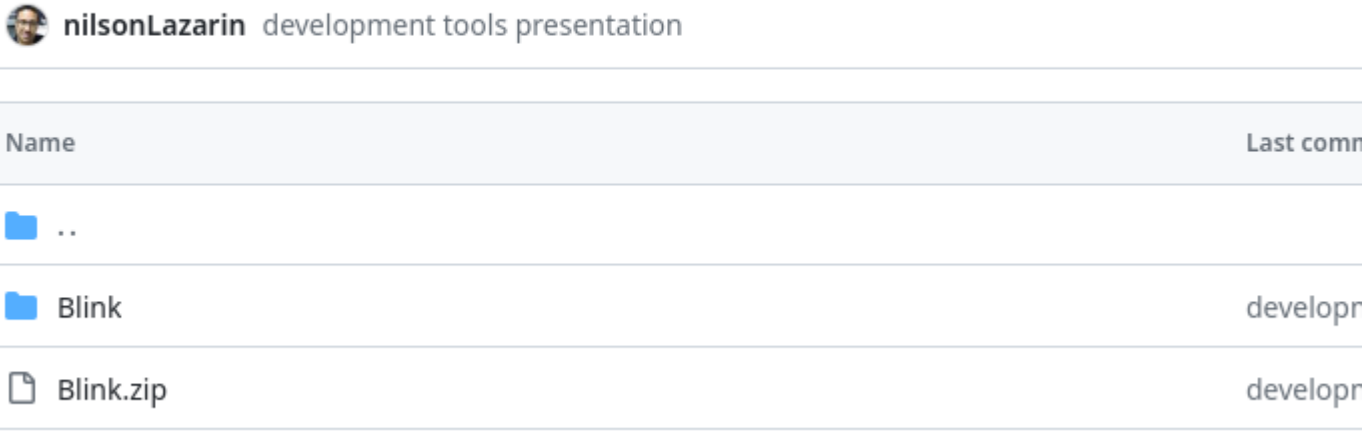
SimulIDE: Blink

distributedAndEmbeddedAI / course / 05-TheDevelopmentTool / **Examples** /



https://github.com/chon-group/distributedAndEmbeddedAI/raw/main/course/05-TheDevelopmentTool/Examples/Blink.zip

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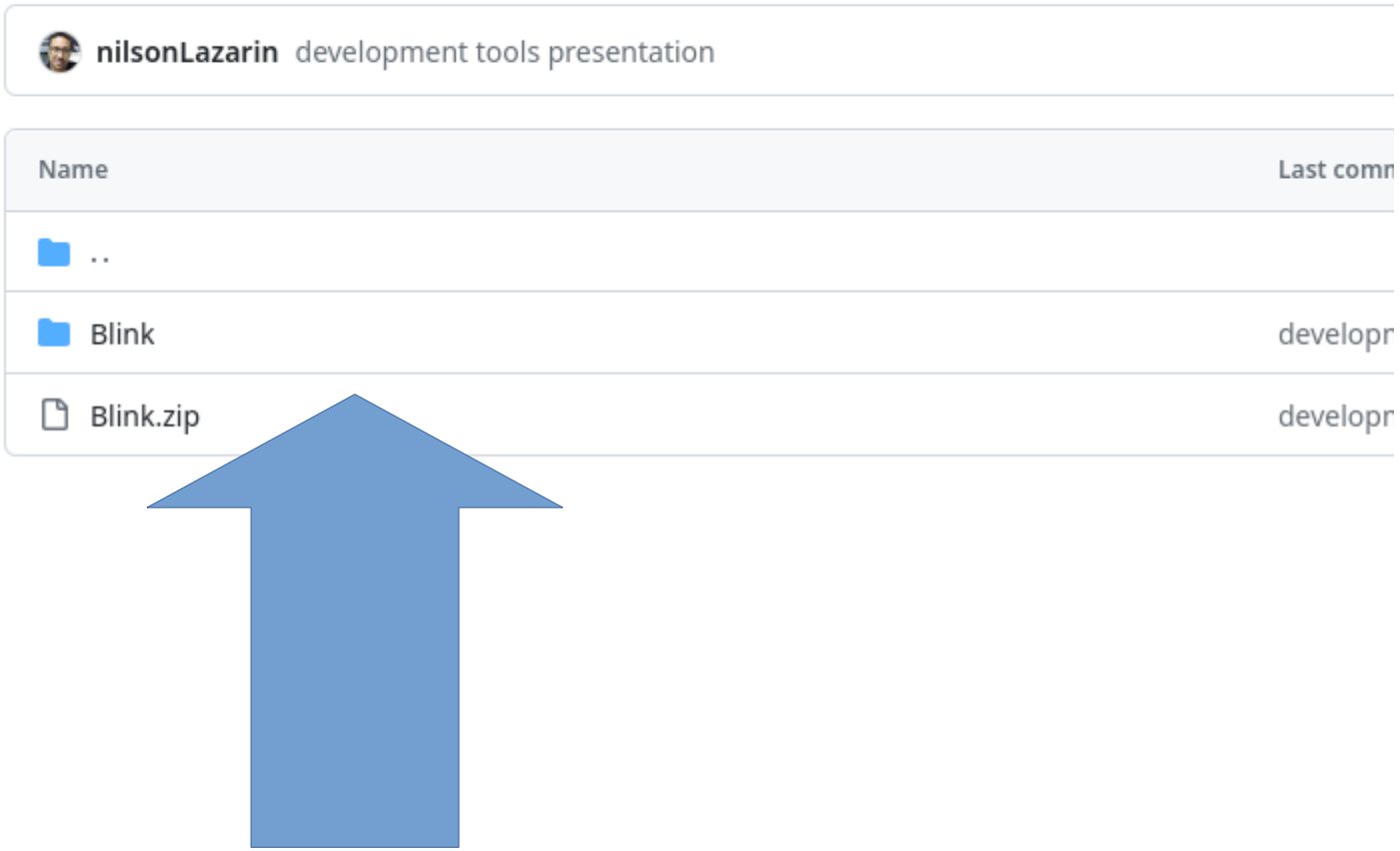
distributedAndEmbeddedAI / course / 05-TheDevelopmentTool / **Examples** /



https://github.com/chon-group/distributedAndEmbeddedAI/raw/main/course/05-TheDevelopmentTool/Examples/Blink.zip

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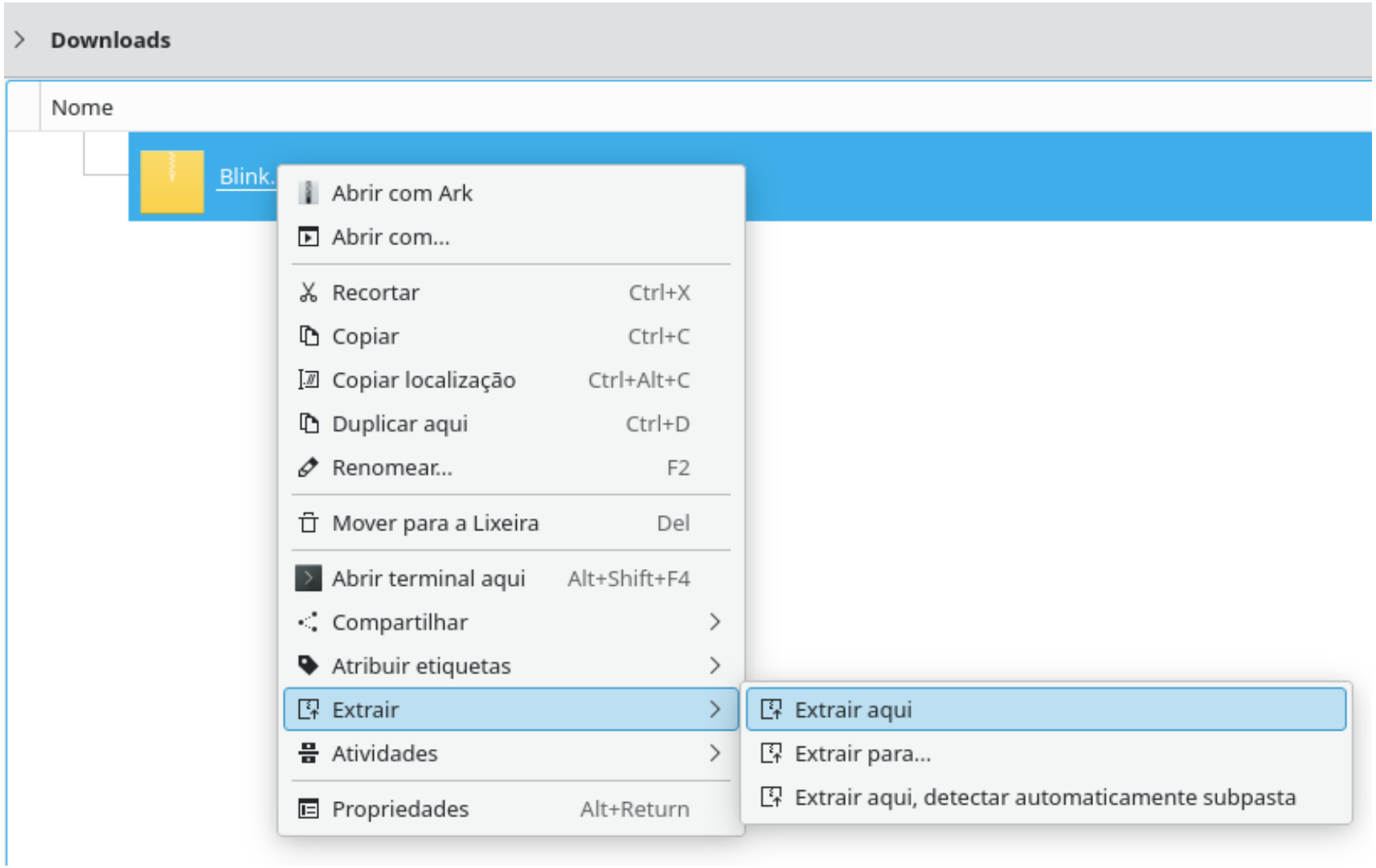

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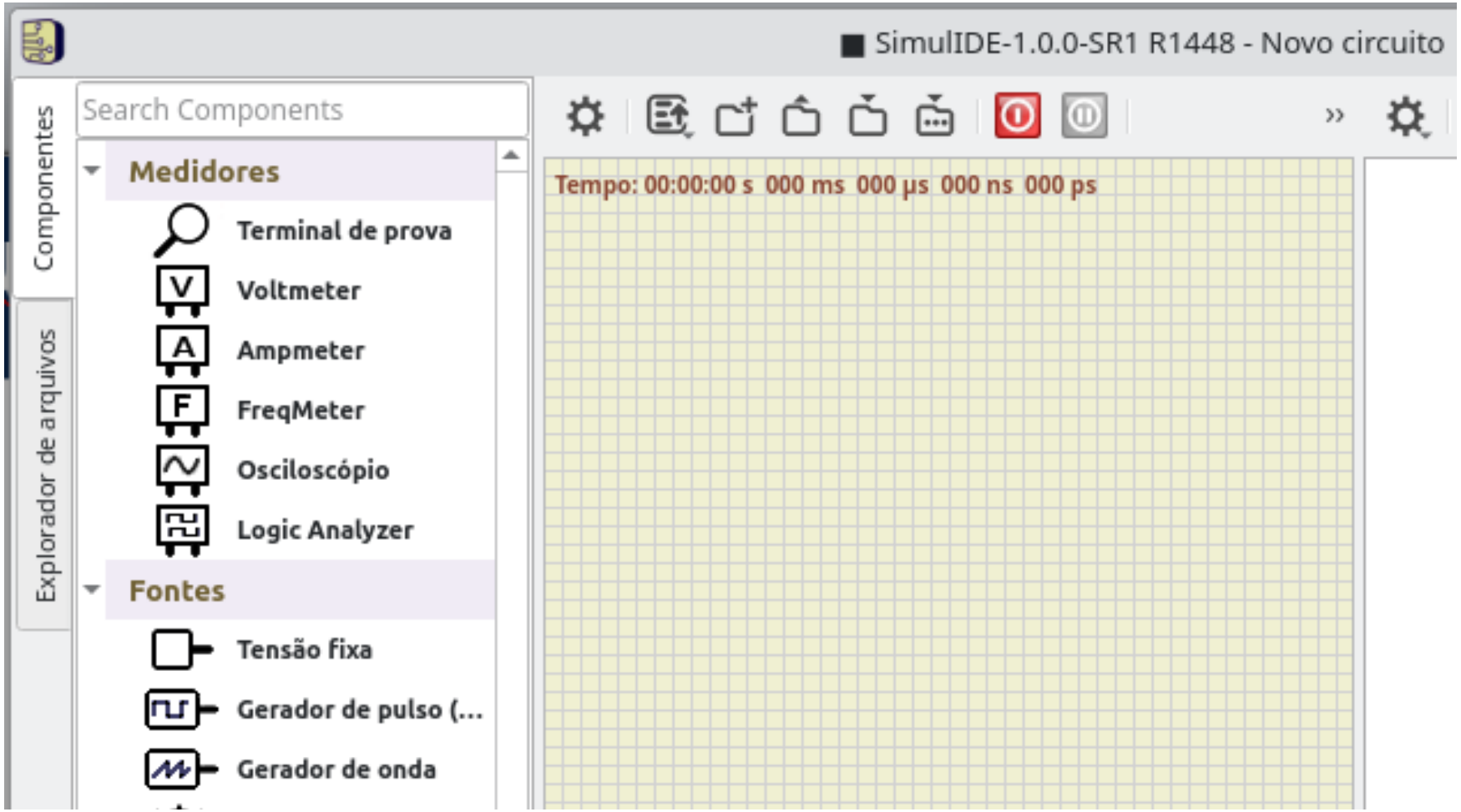

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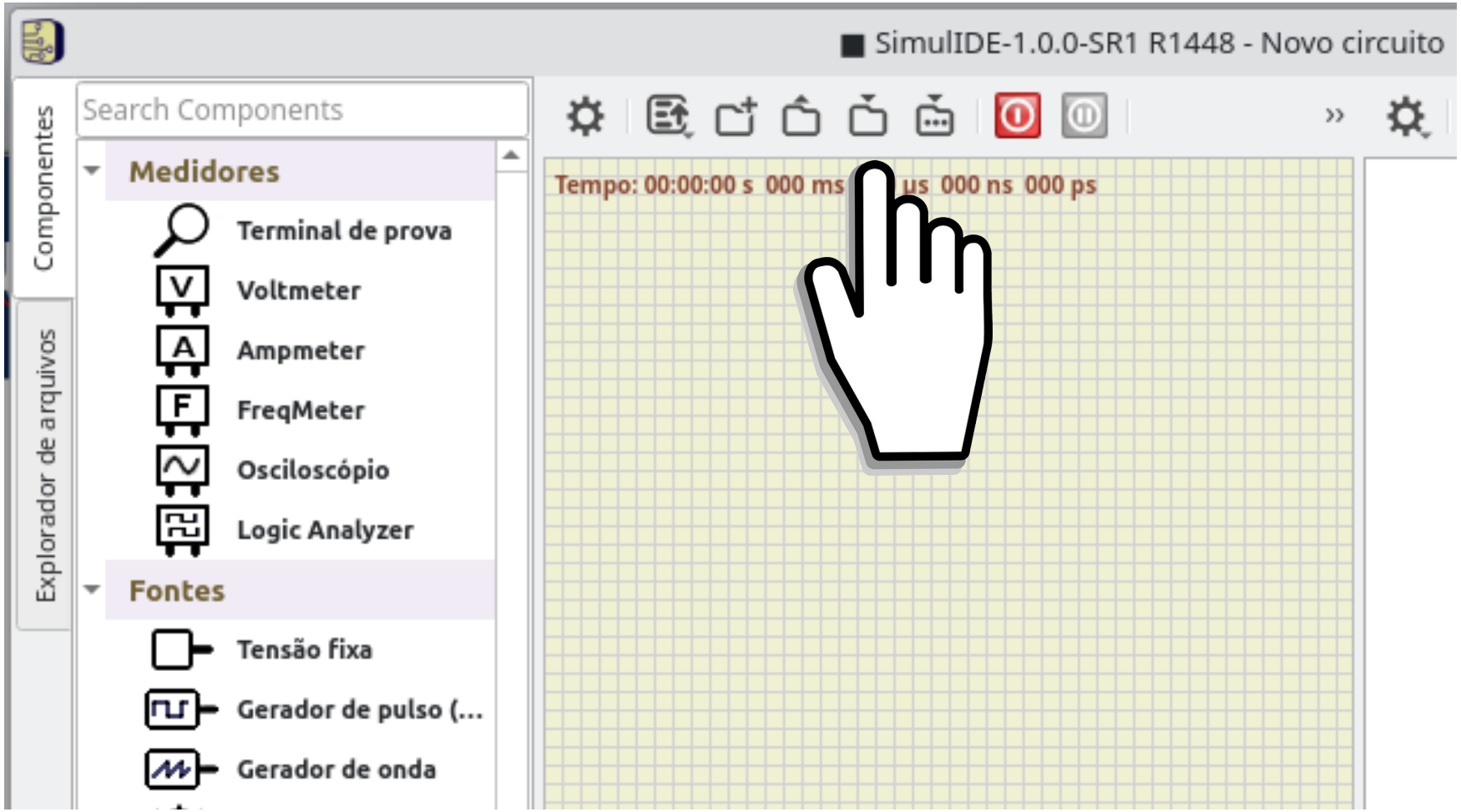

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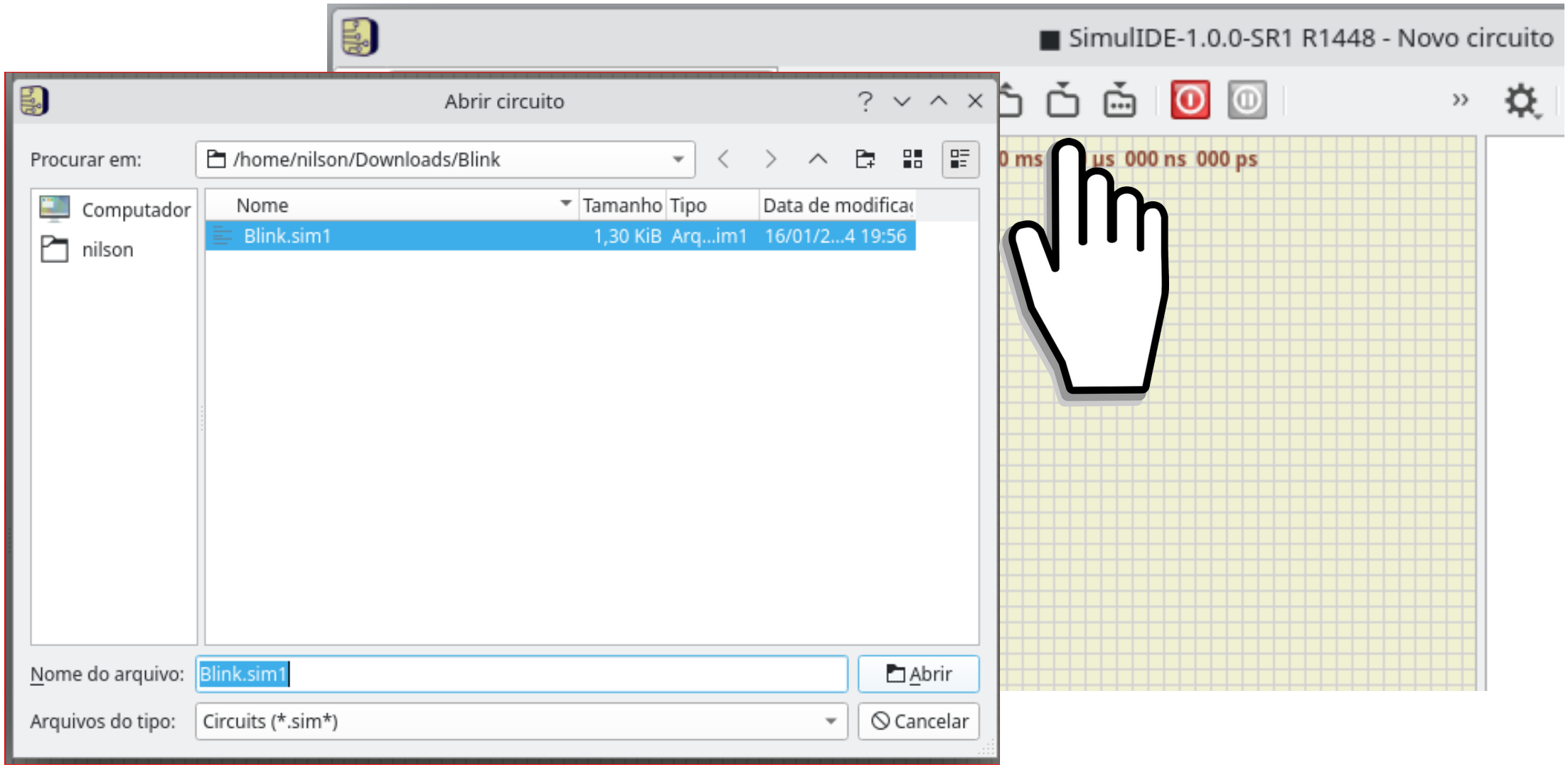

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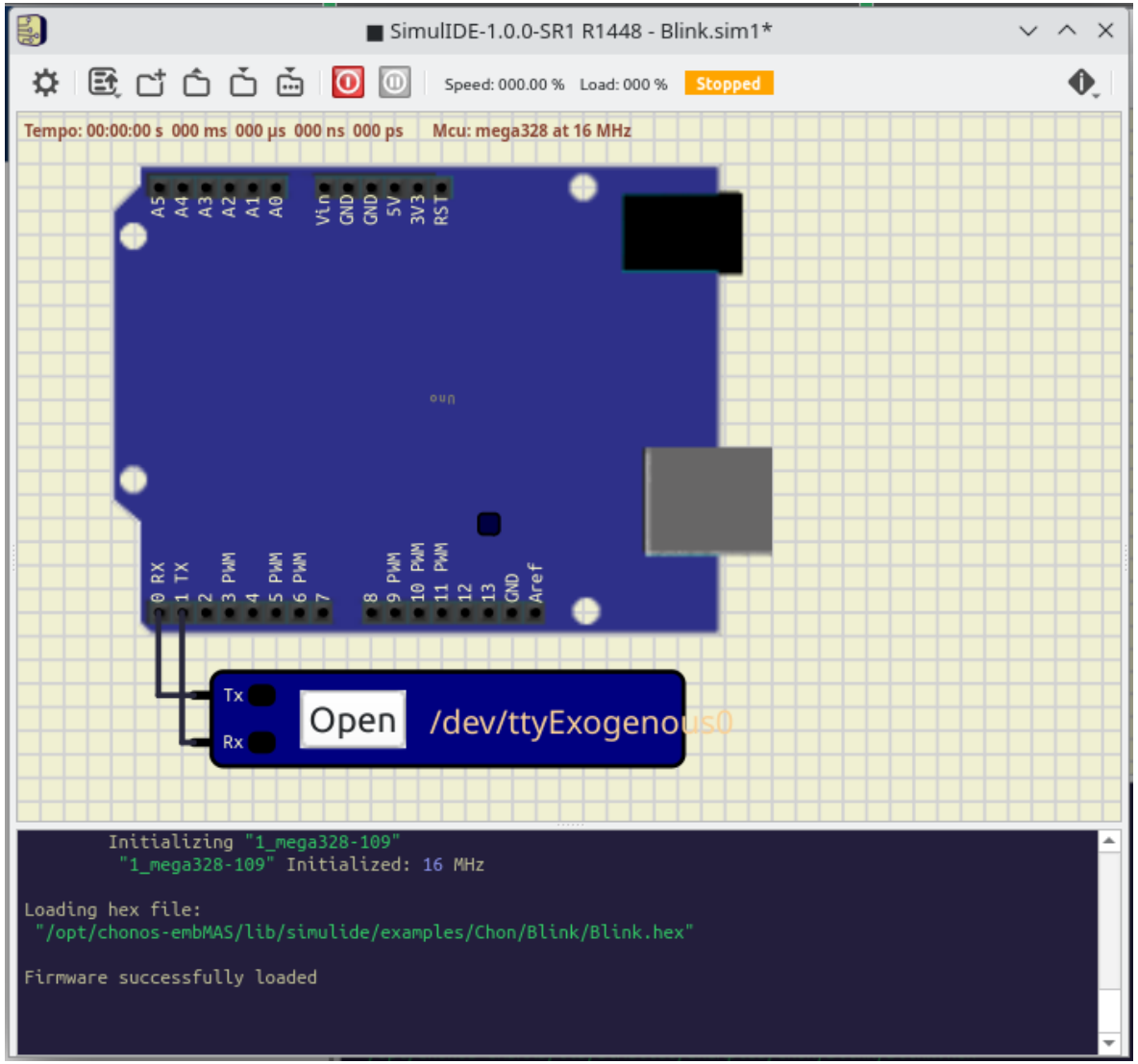

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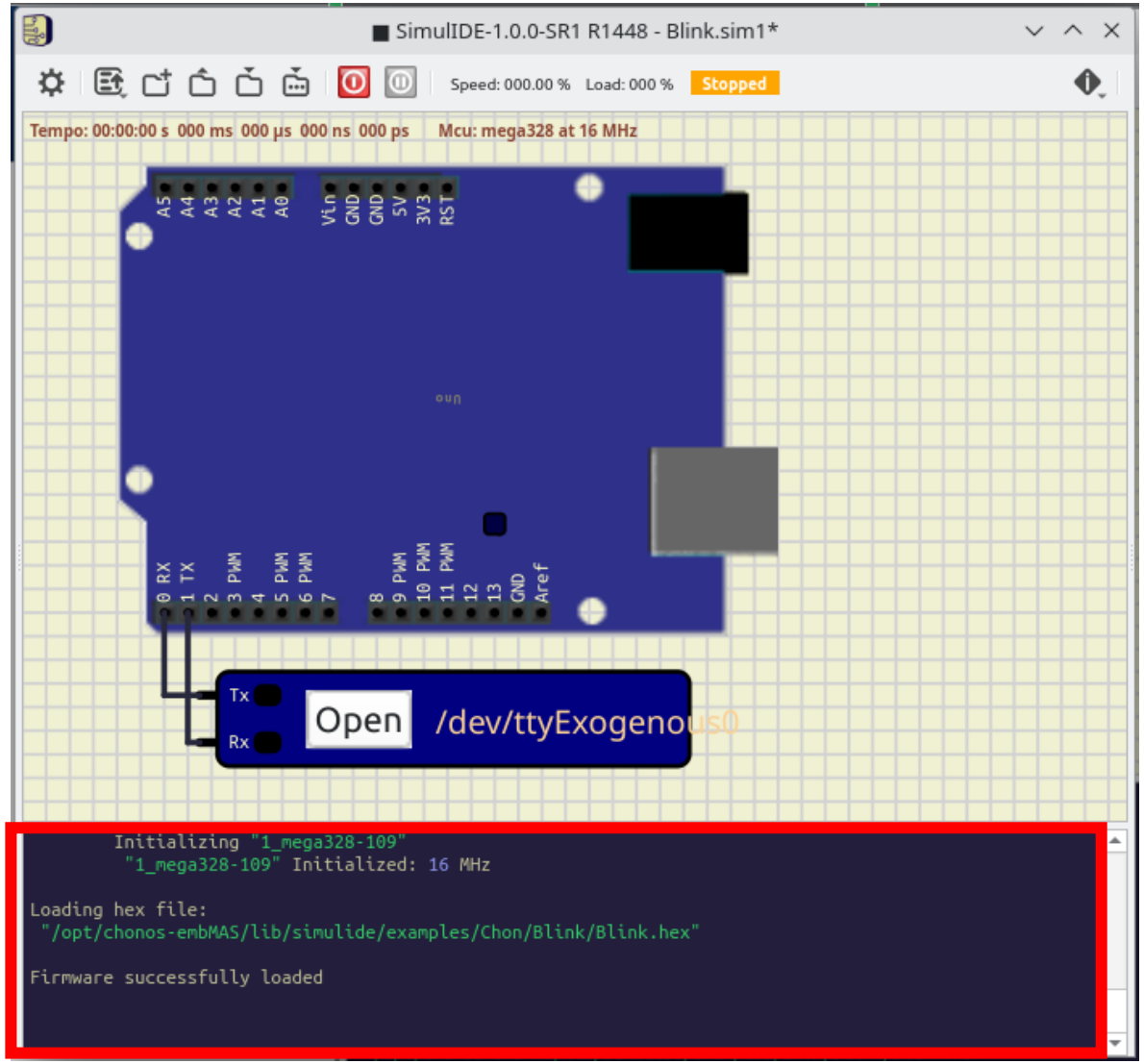

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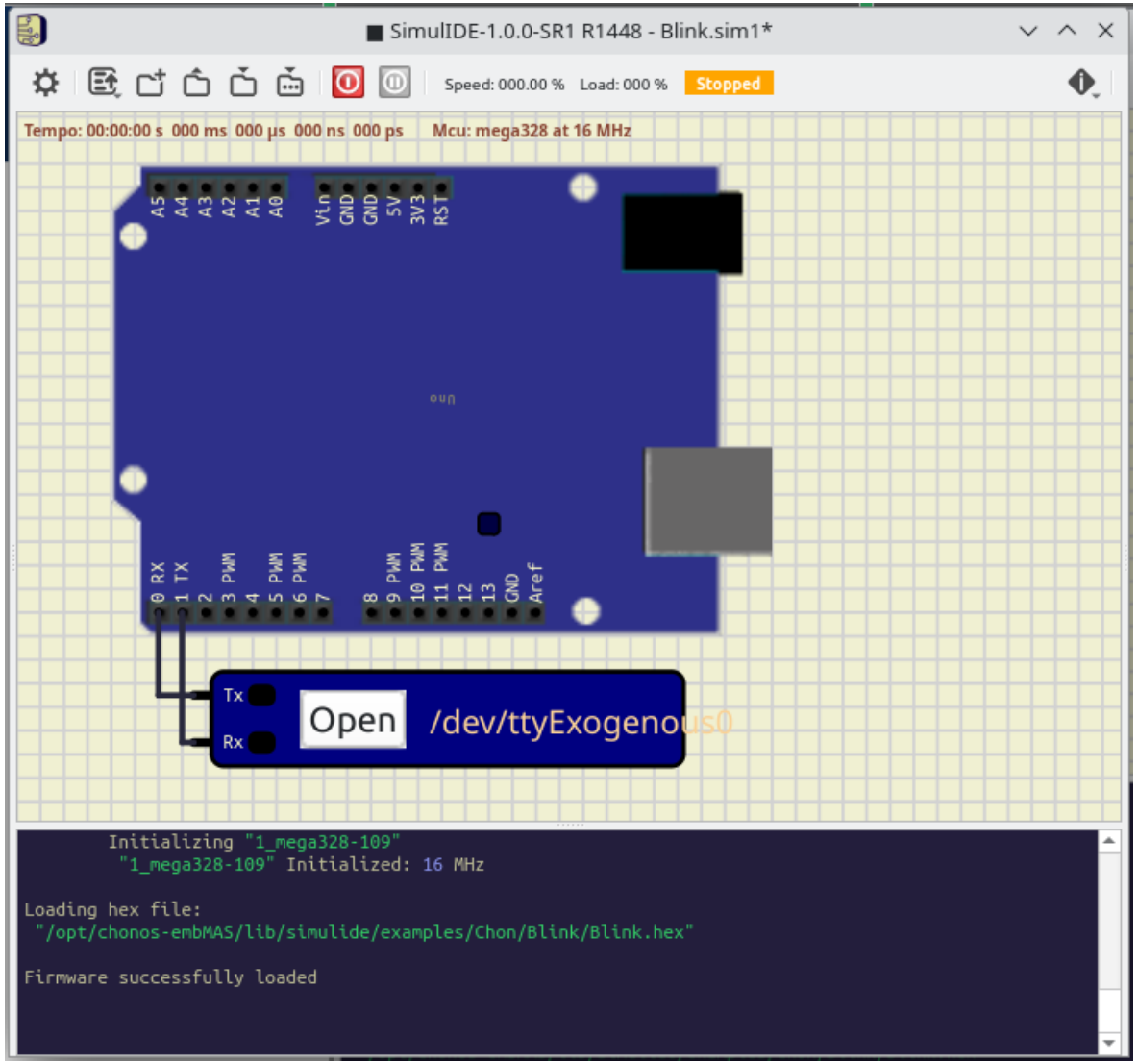

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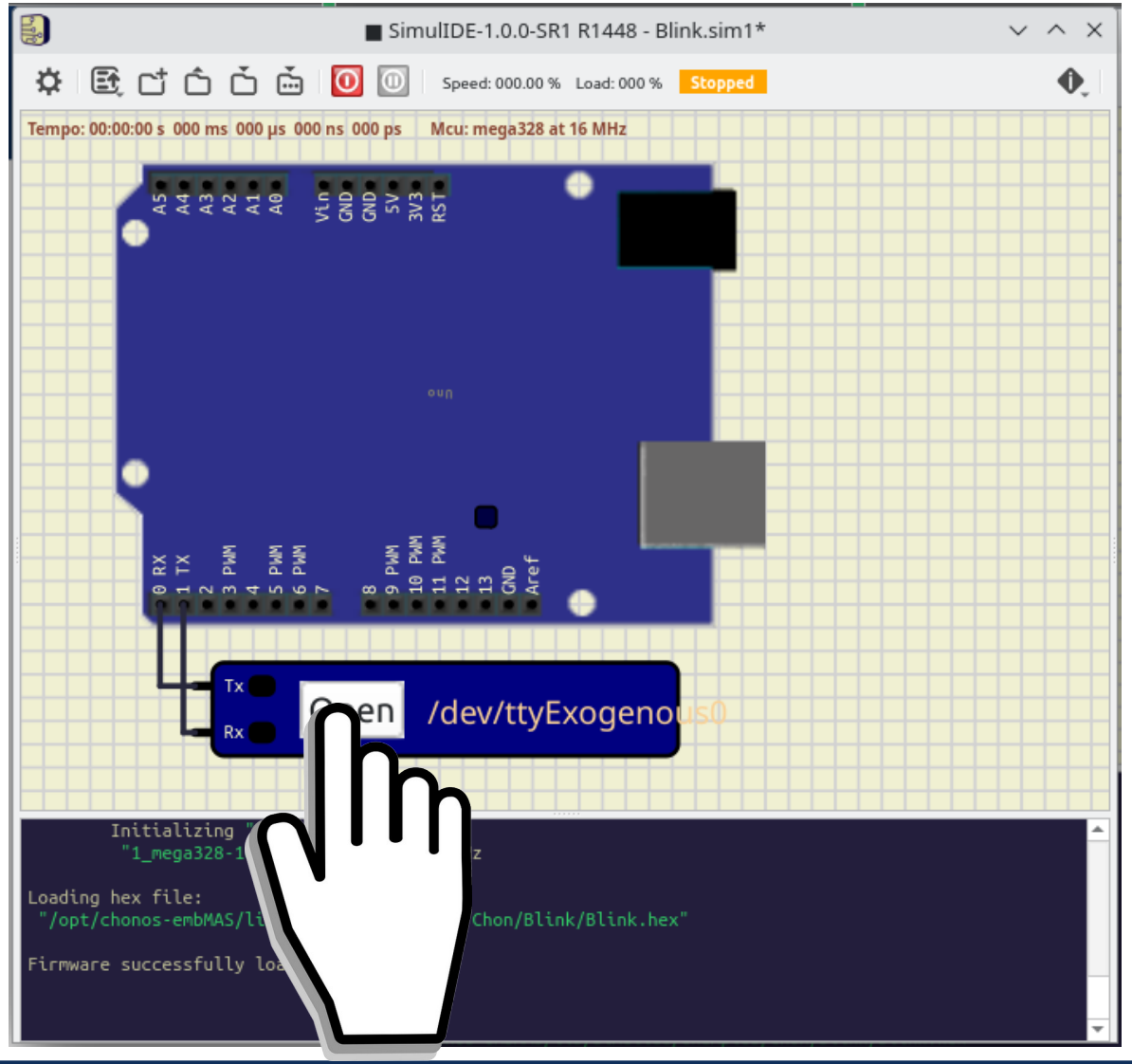

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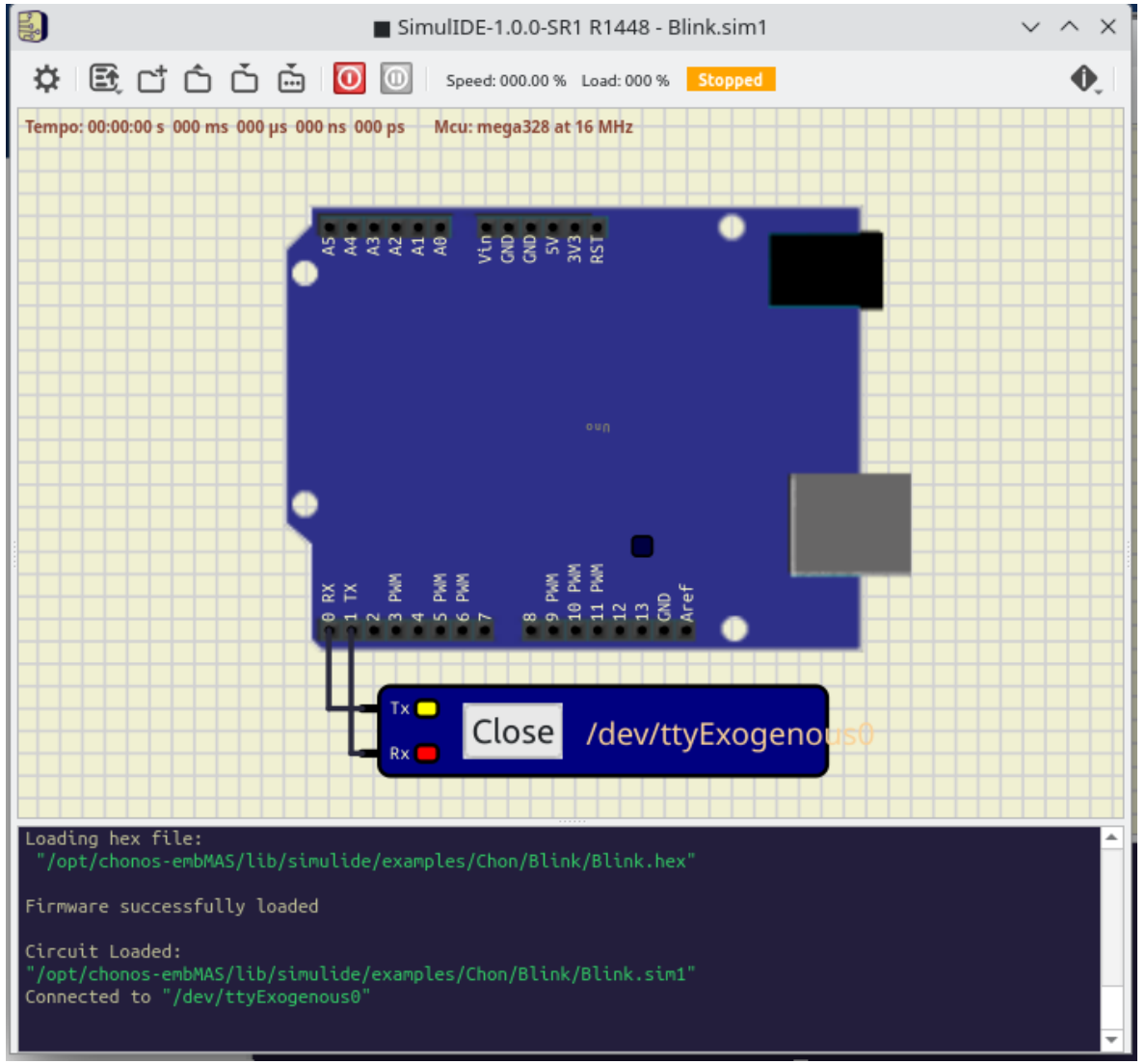

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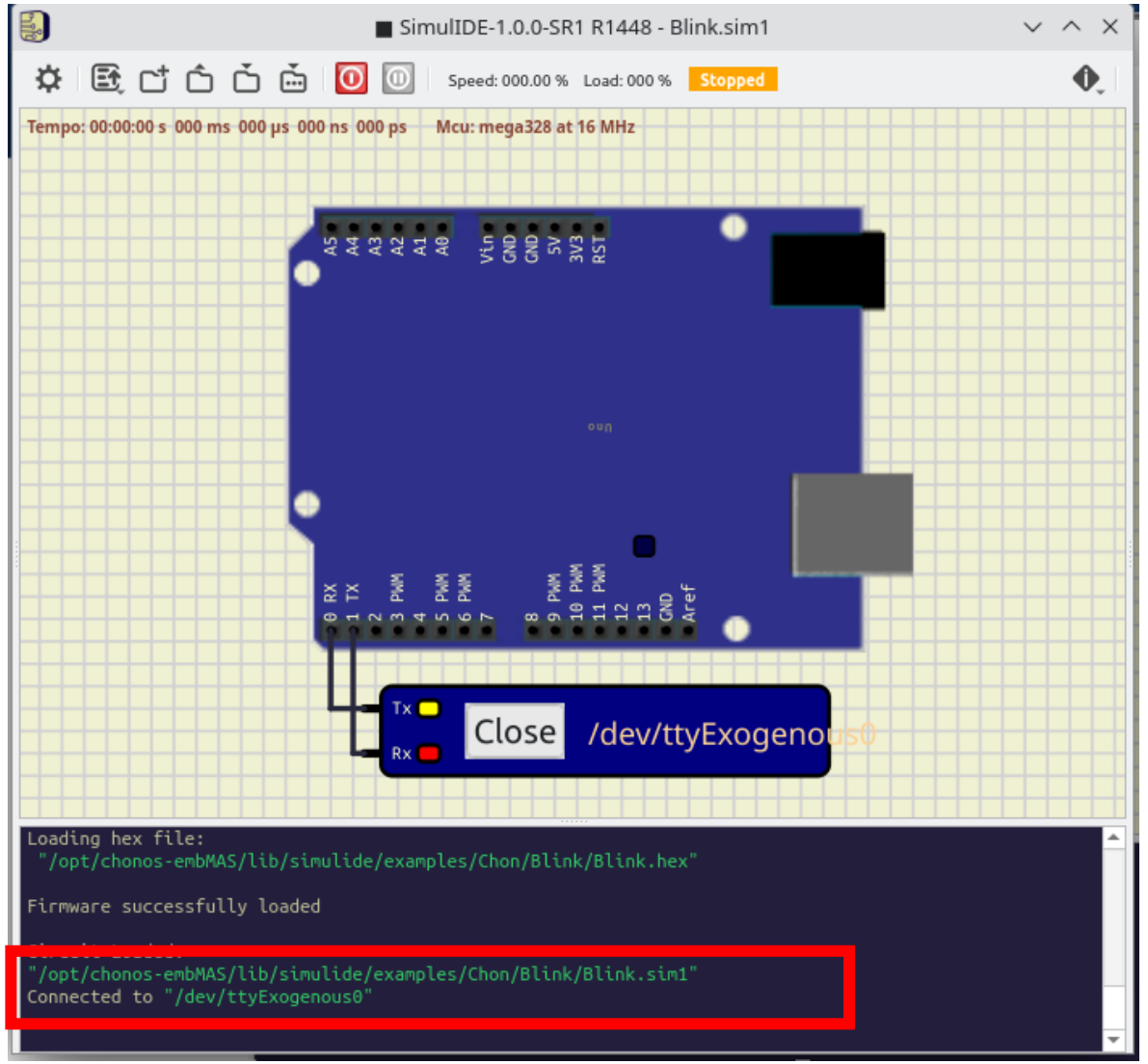

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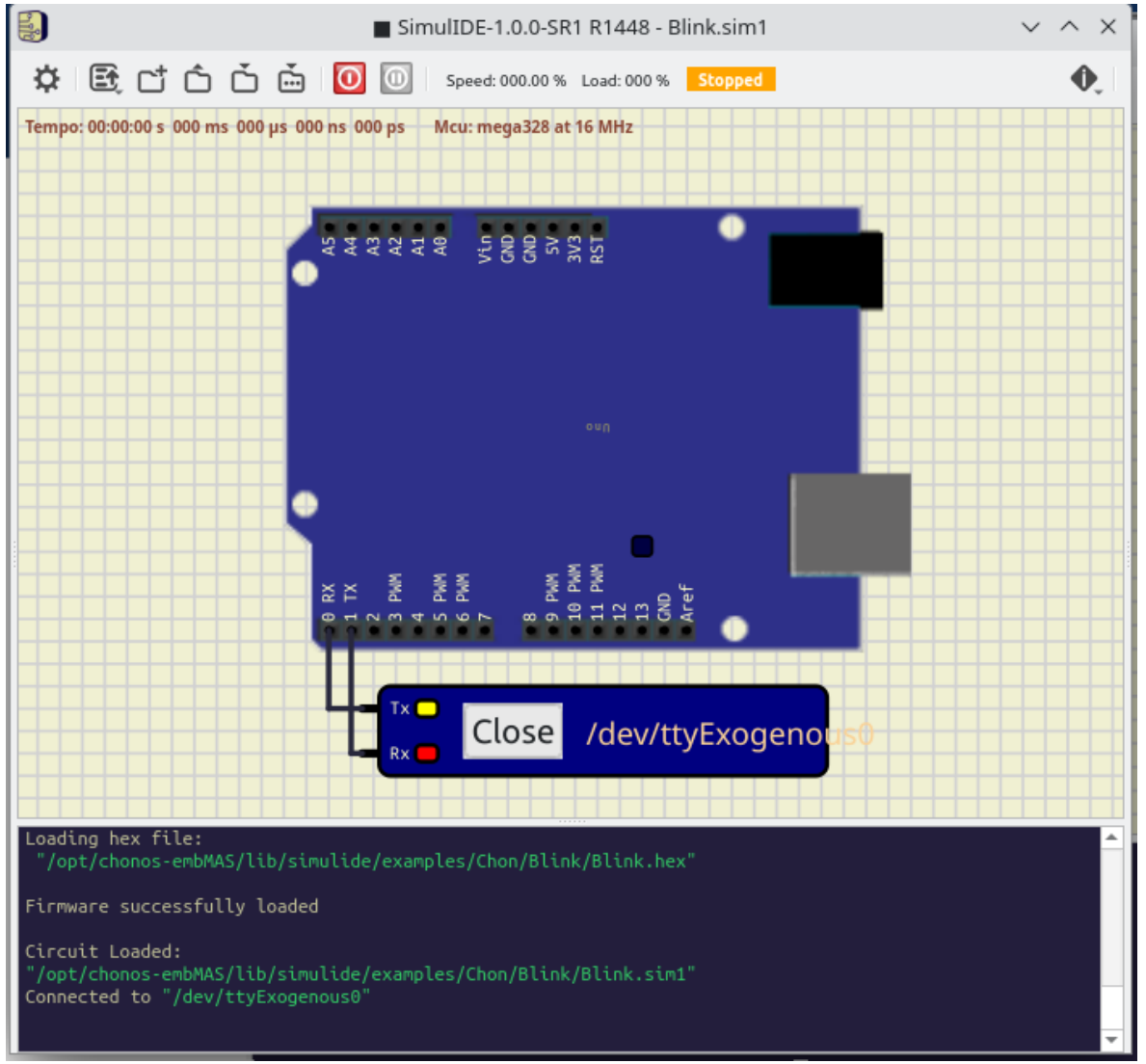

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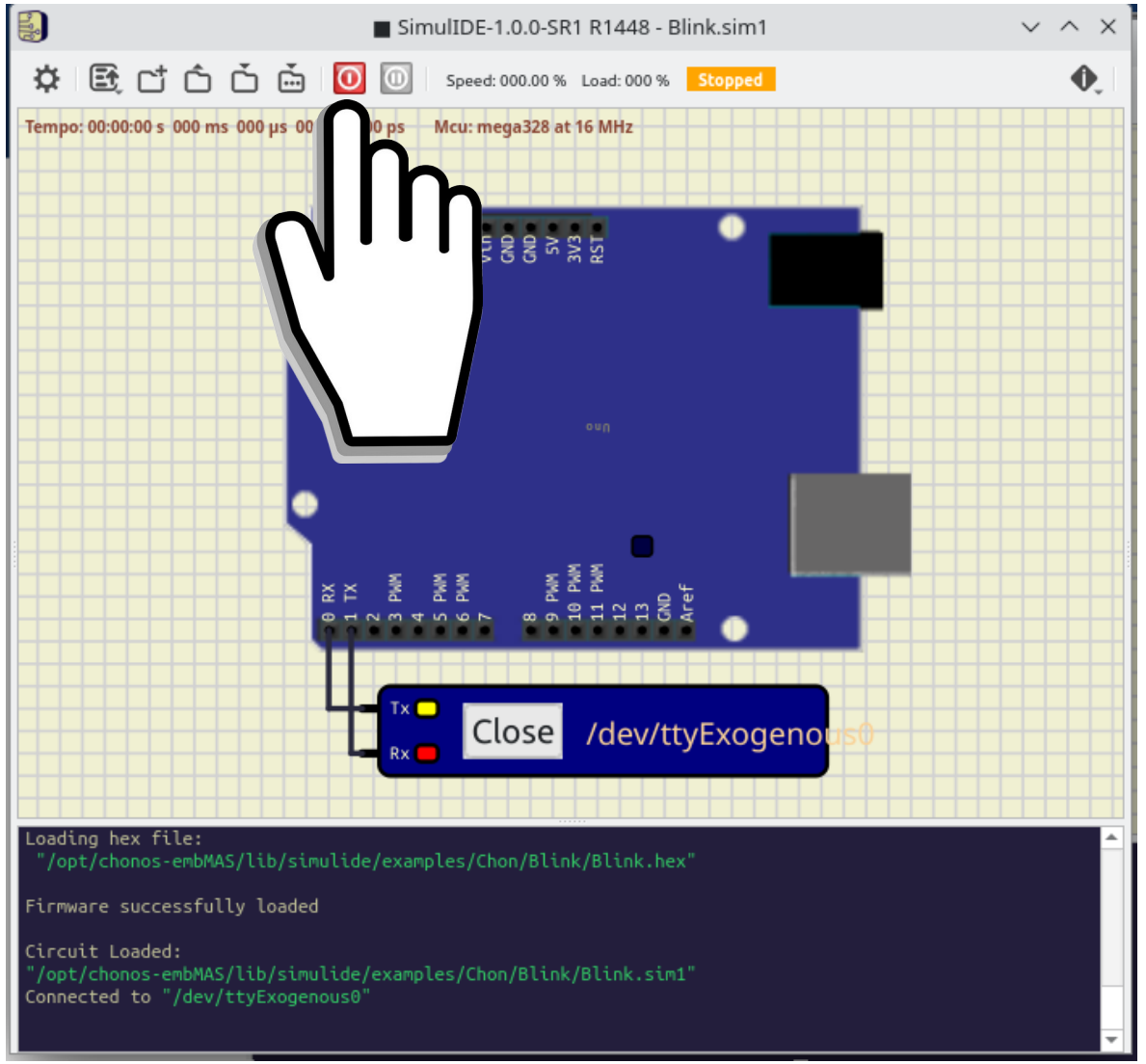

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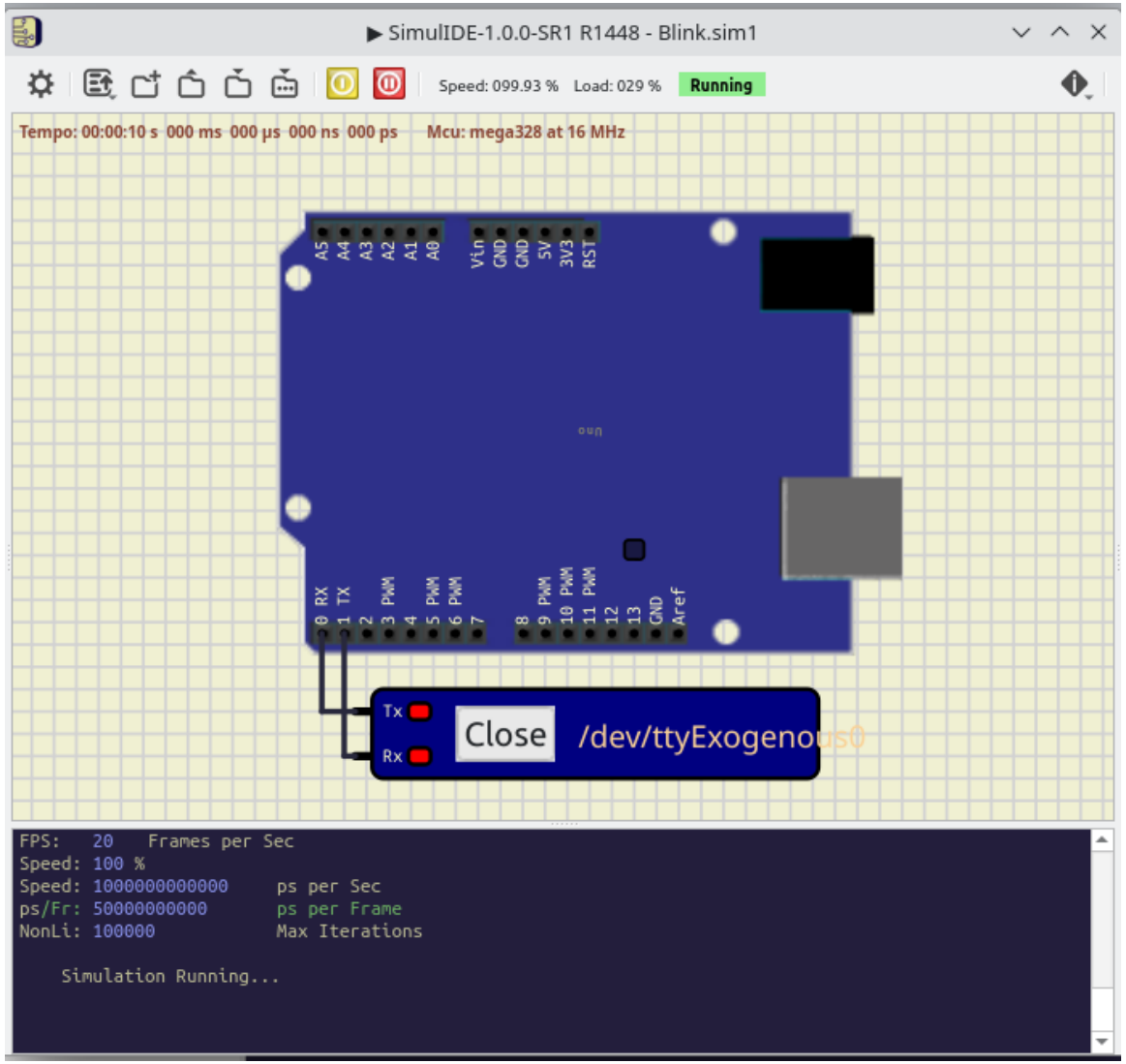

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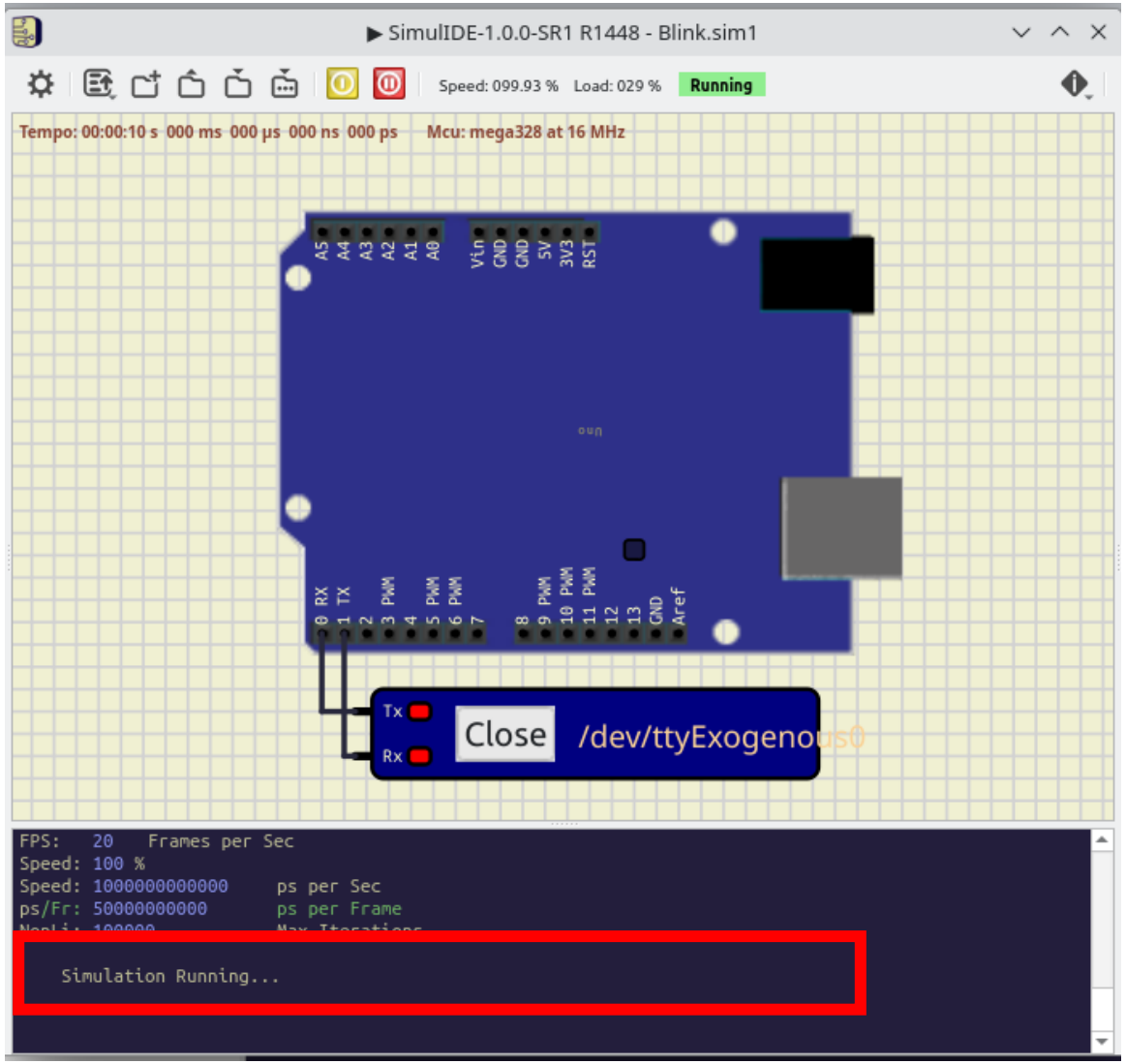

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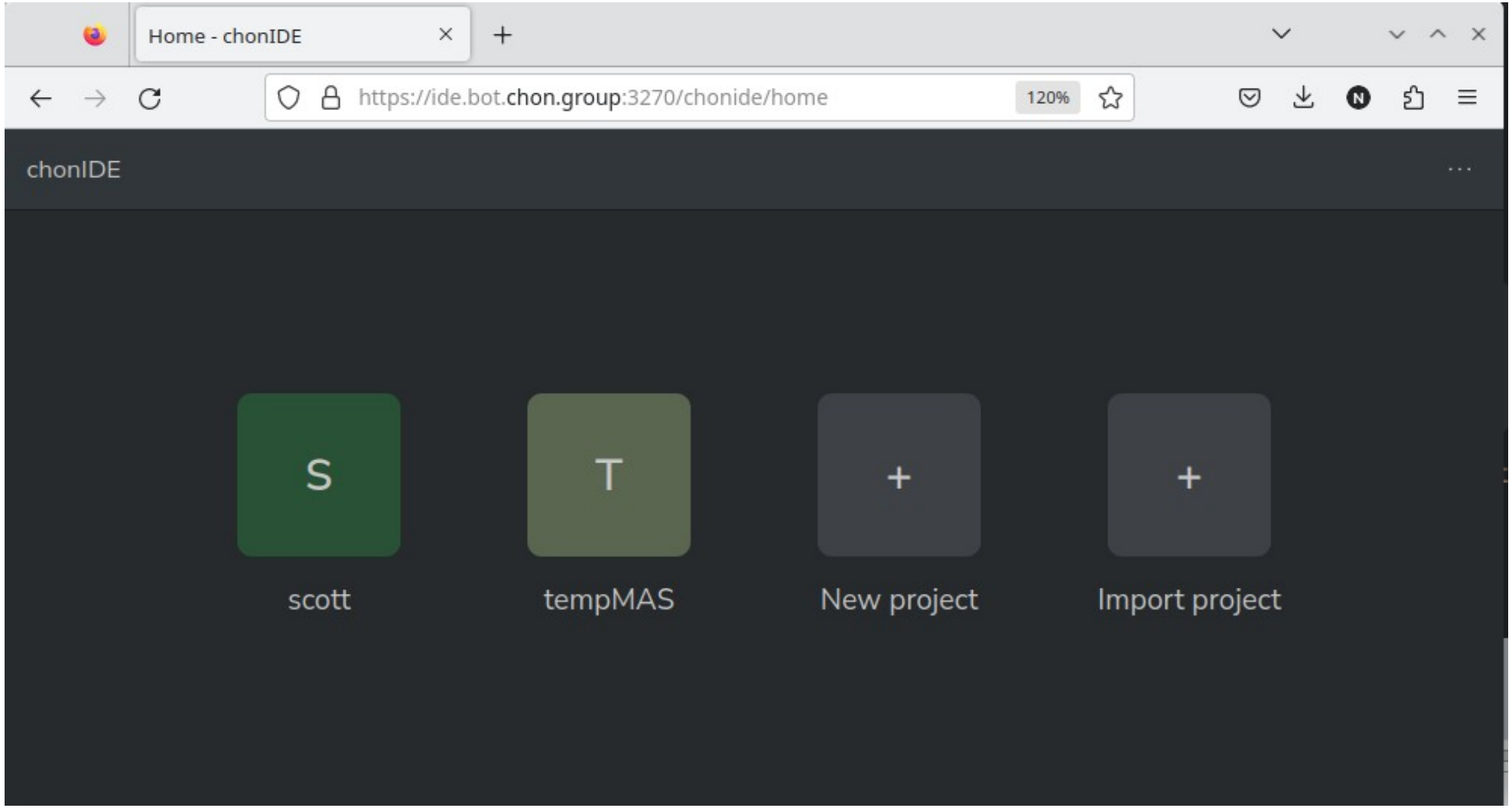

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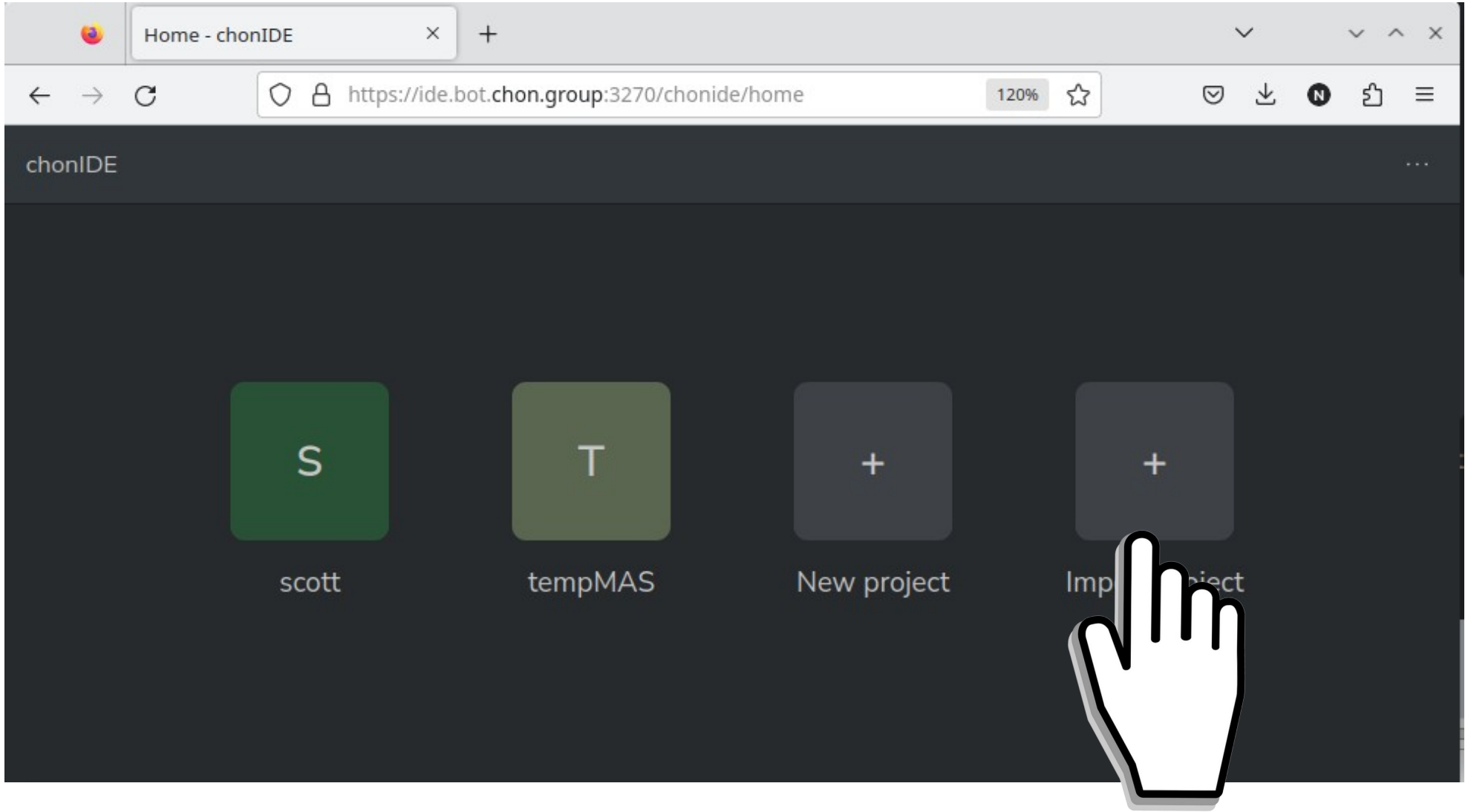

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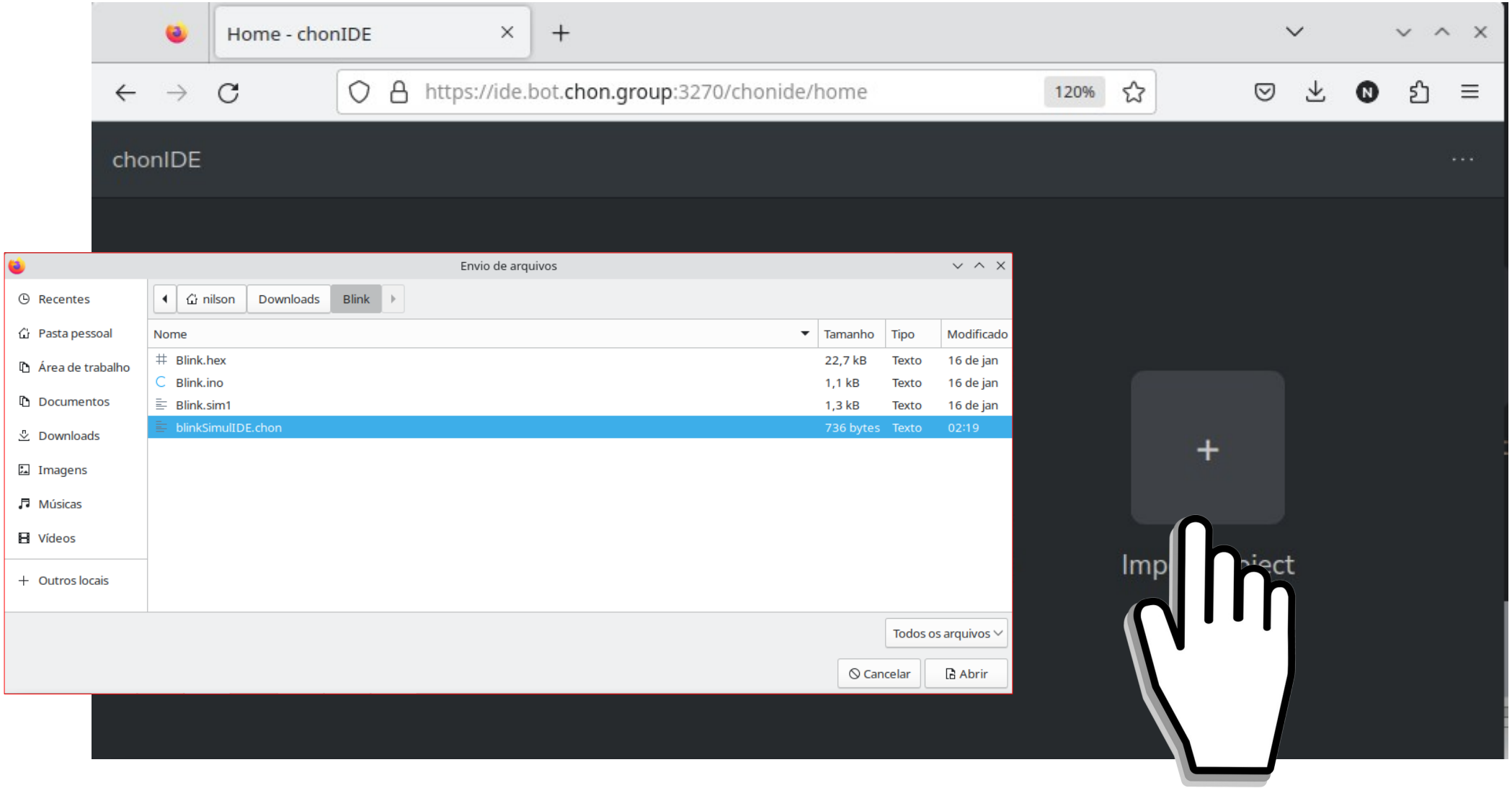

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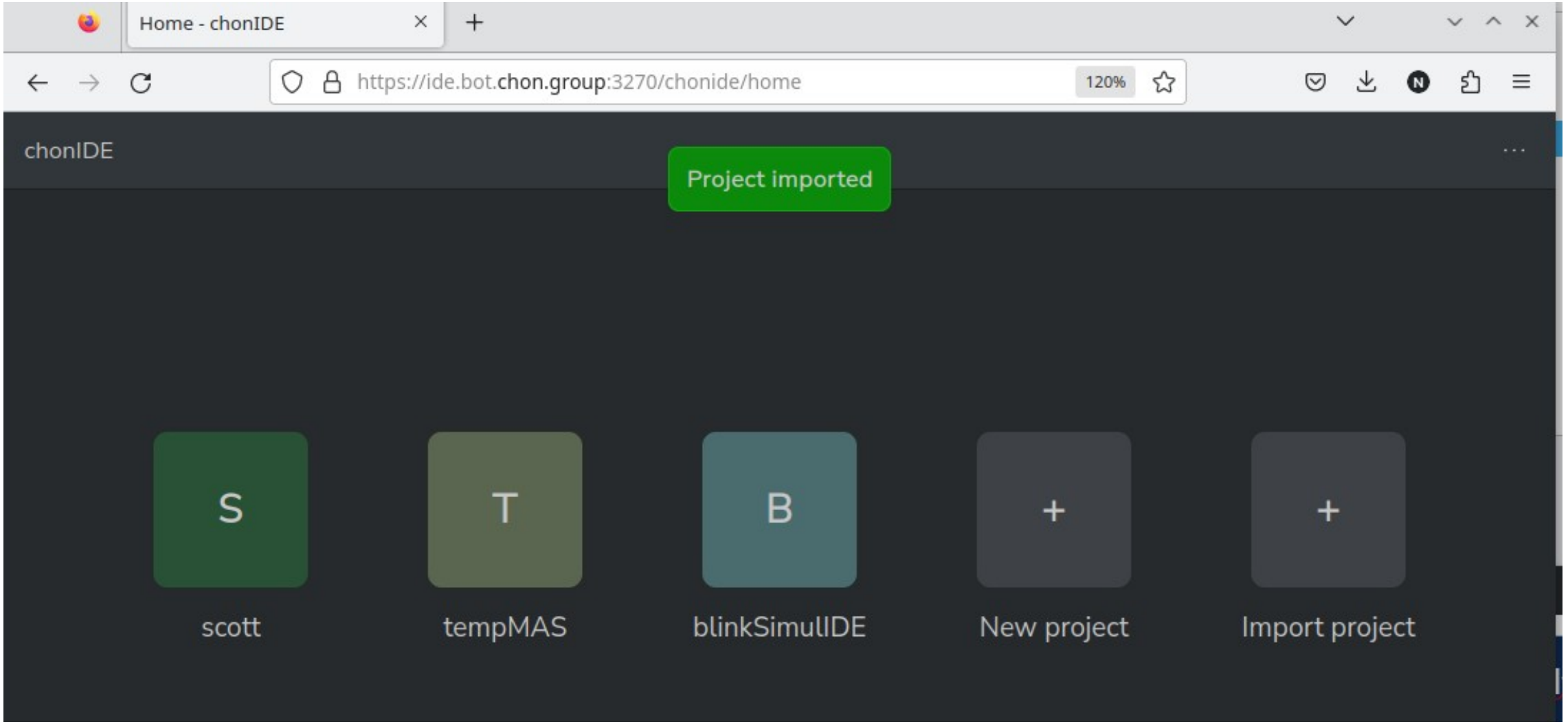

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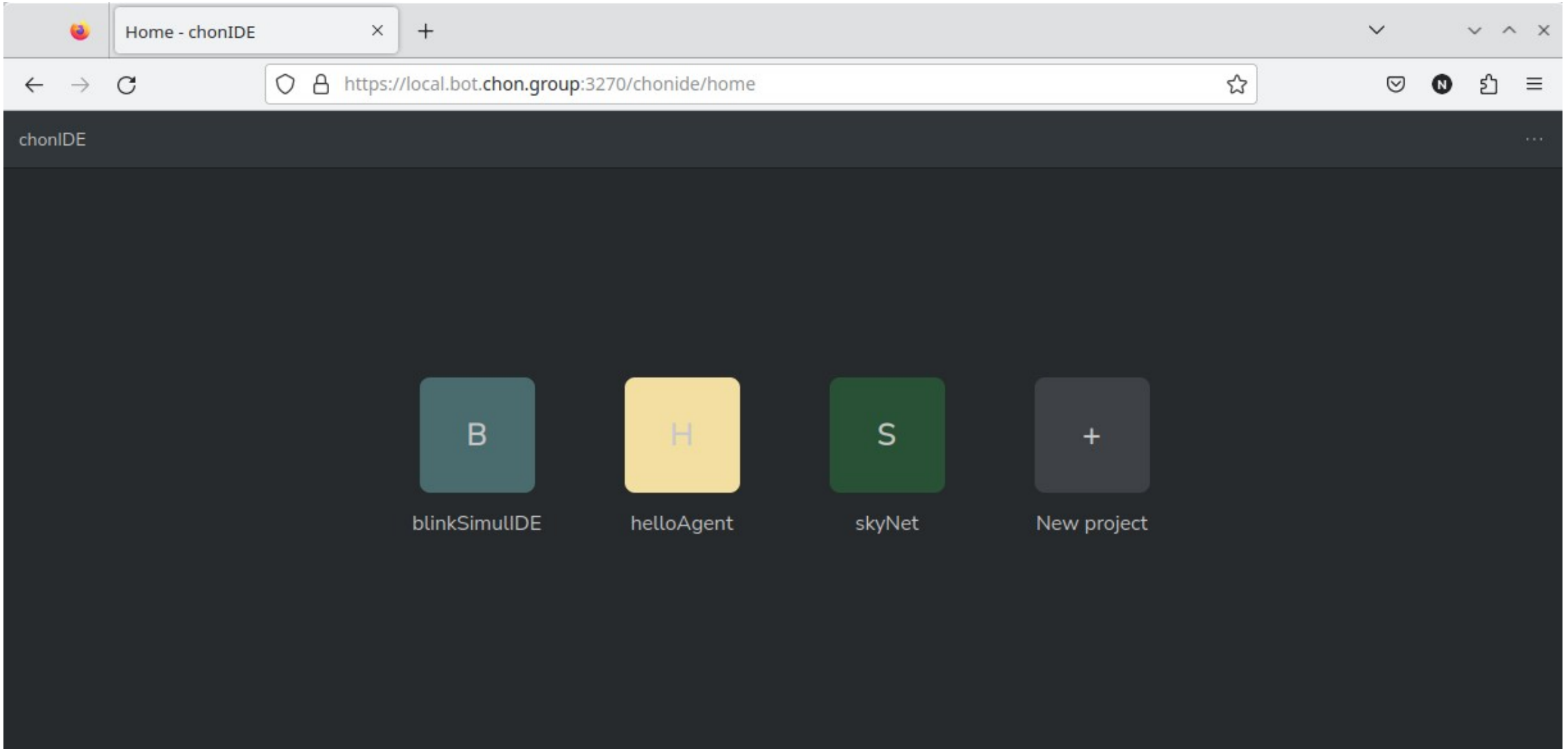

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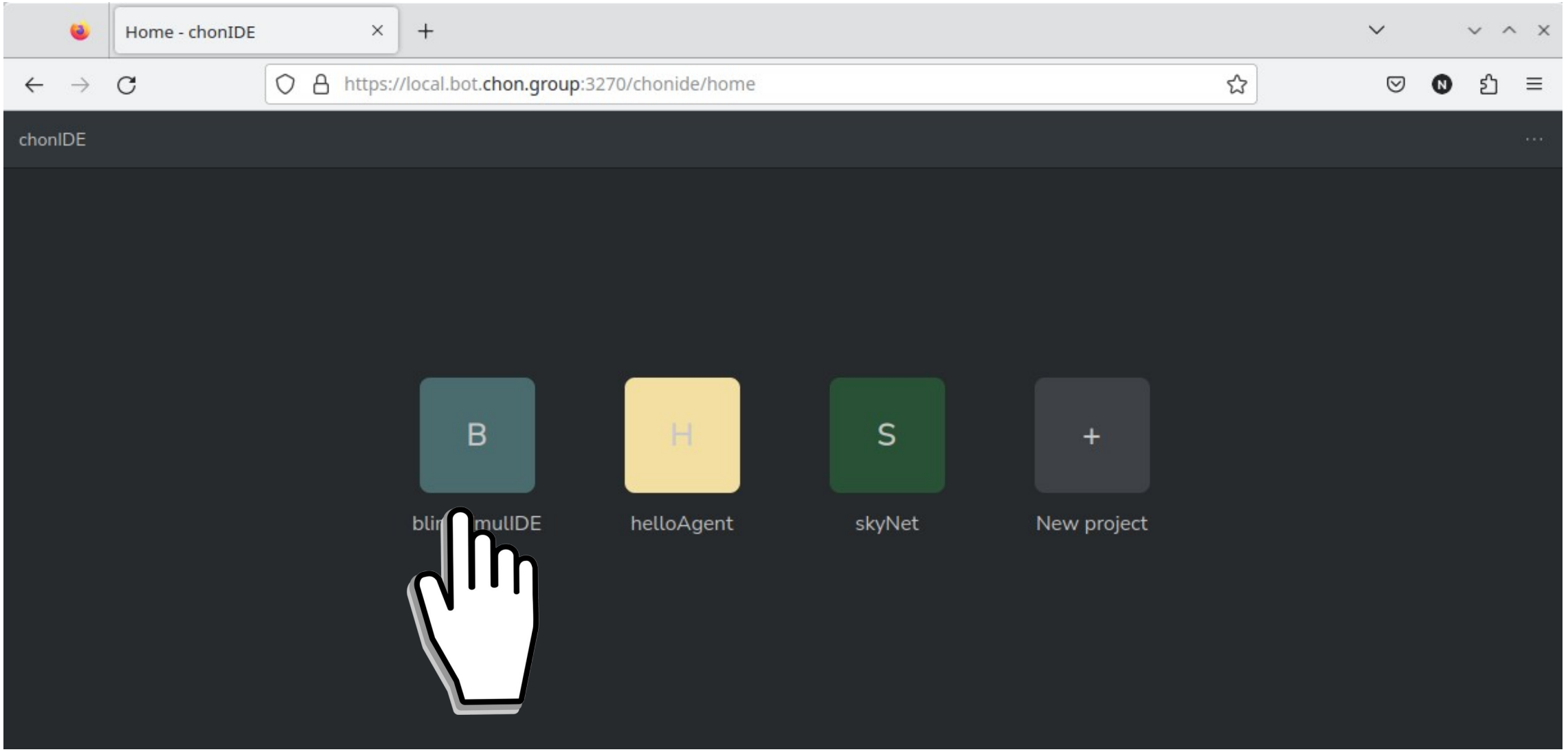

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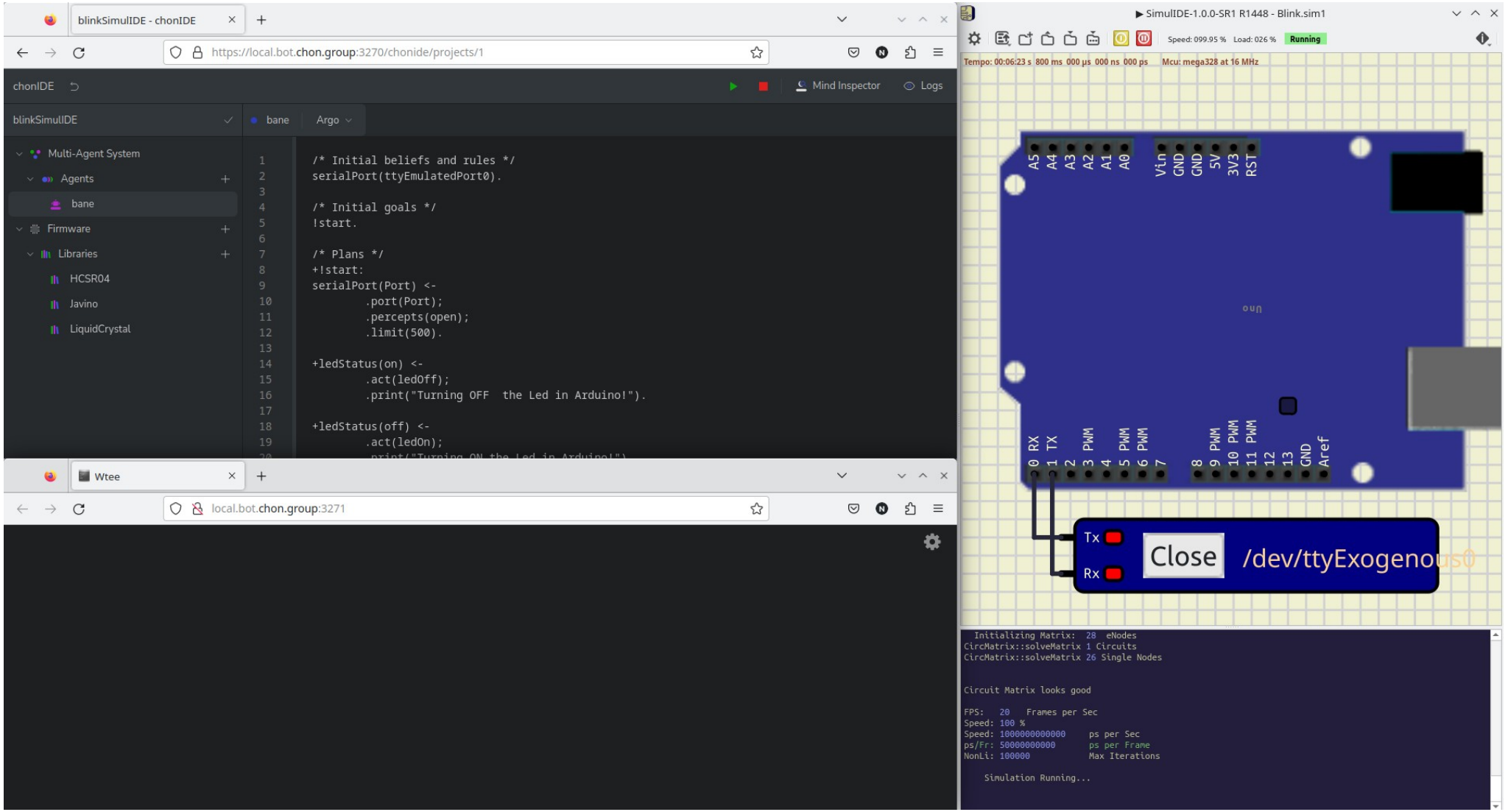

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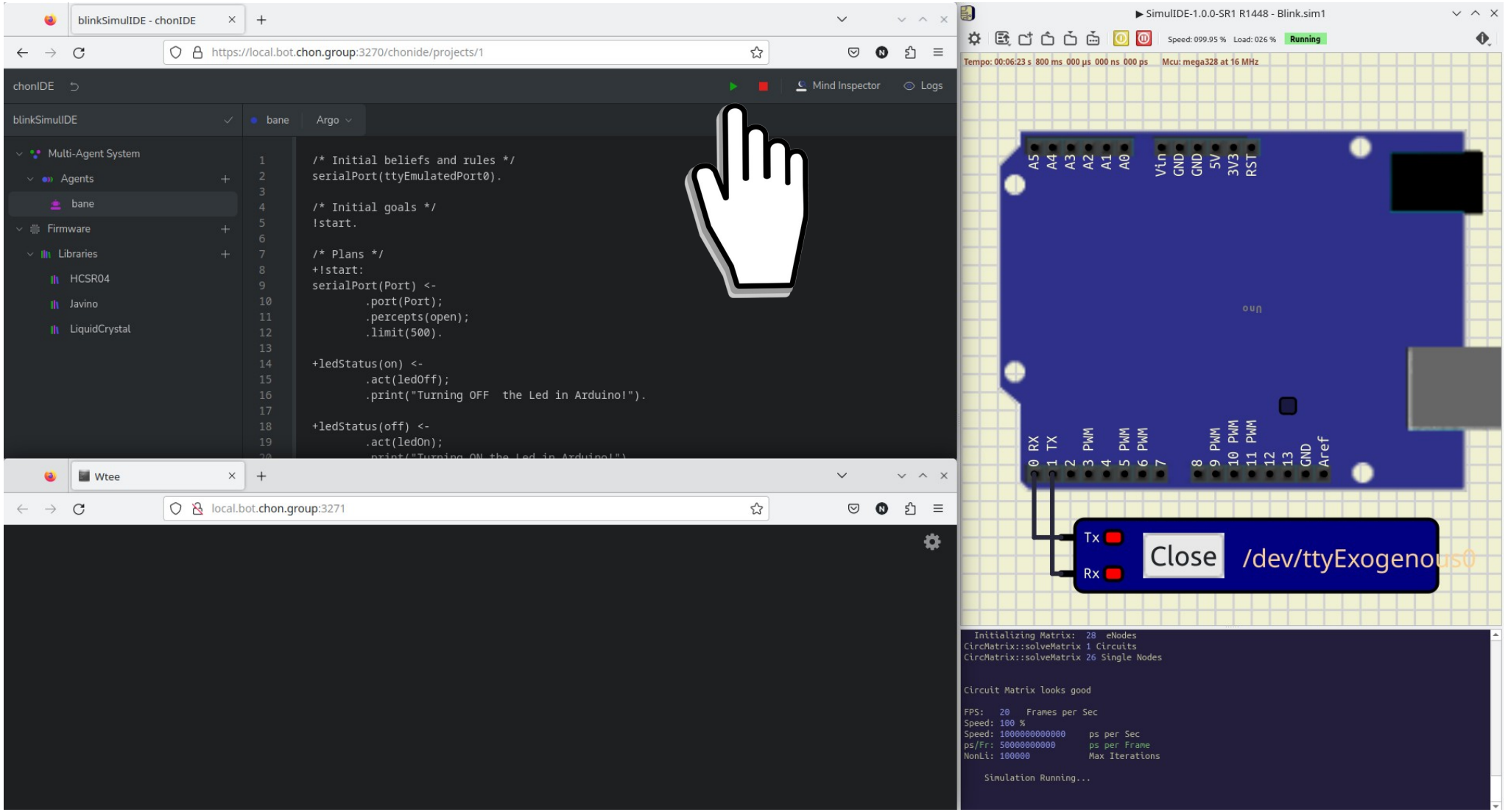

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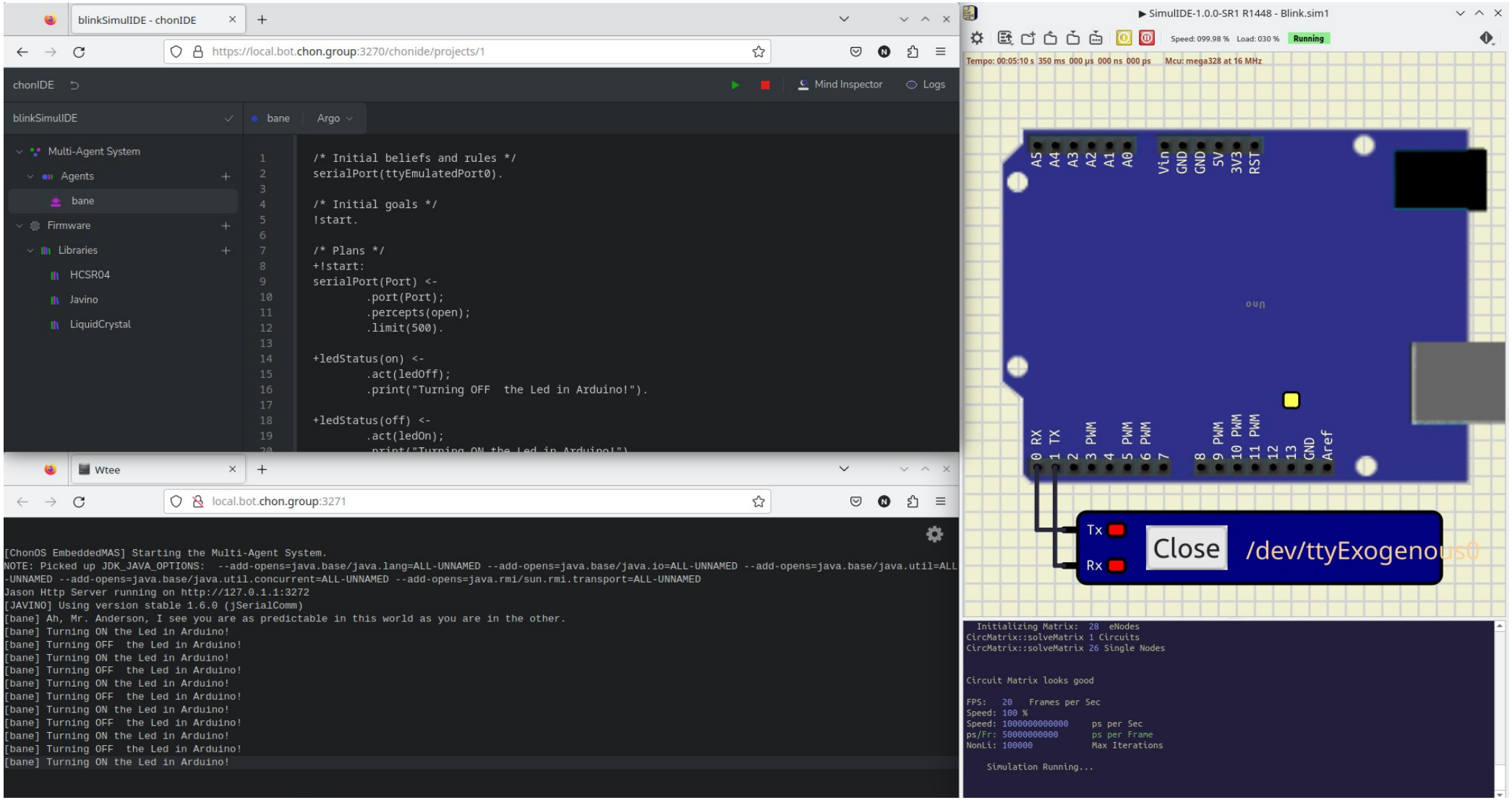
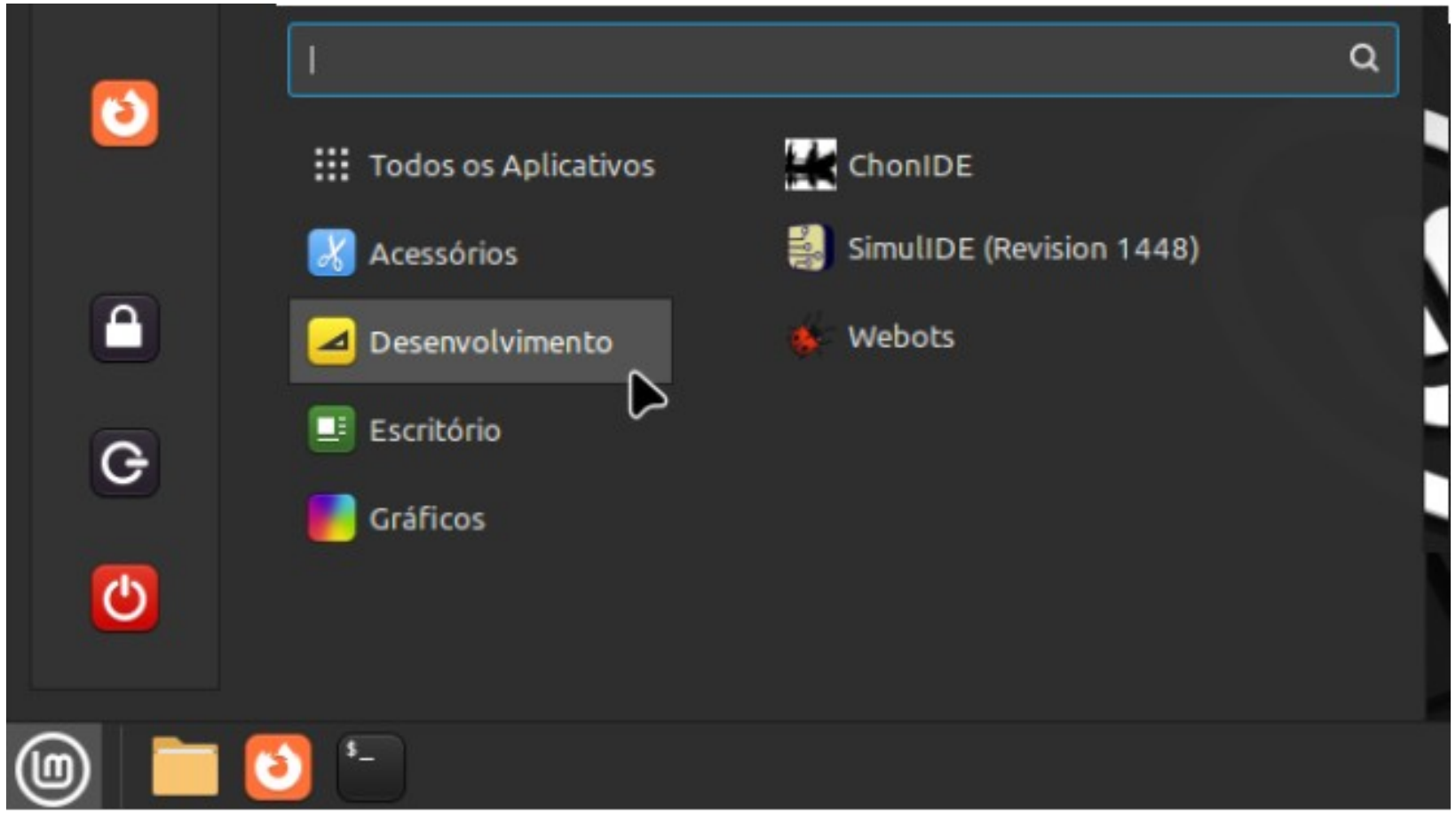


Webots

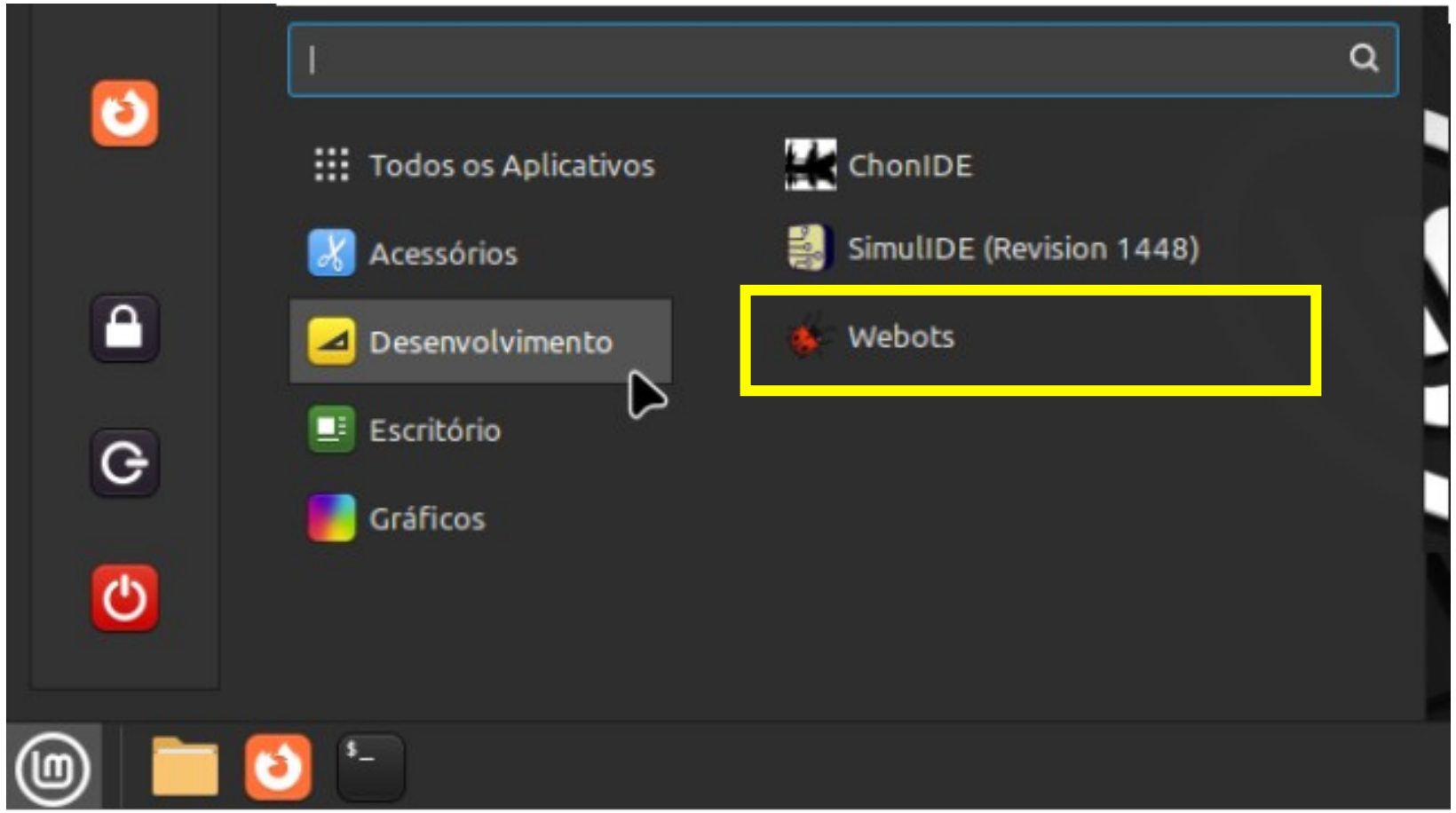
Michel, O. (1998). Webots: Symbiosis Between Virtual and Real Mobile Robots. In: Heudin, JC. (eds) Virtual Worlds. VW 1998. Lecture Notes in Computer Science(), vol 1434. Springer, Berlin, Heidelberg. https://doi.org/10.1007/3-540-68686-X_24

Webots



Manual de instalação
https://cyberbotics.com/doc/guide/installation-procedure#installing-the-debian-package-with-the-advanced-packaging-tool-apt

Webots



Manual de instalação
https://cyberbotics.com/doc/guide/installation-procedure#installing-the-debian-package-with-the-advanced-packaging-tool-apt

Webots

distributedAndEmbeddedAI / course / 05-TheDevelopmentTool / Examples /

nilsonLazarin Car4WD Simulated World developed by @bptfreitas

Name	Last commit r
..	
Blink	developmer
Car4WD	Car4WD Sim
Blink.zip	developmer
Car4WD.zip	Car4WD Sim

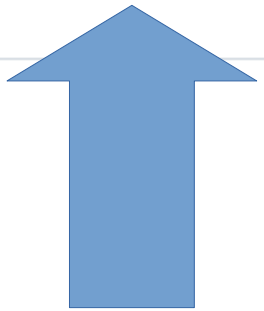
https://github.com/chon-group/distributedAndEmbeddedAI/raw/main/course/05-TheDevelopmentTool/Examples/Car4WD.zip

Webots

distributedAndEmbeddedAI / course / 05-TheDevelopmentTool / Examples /

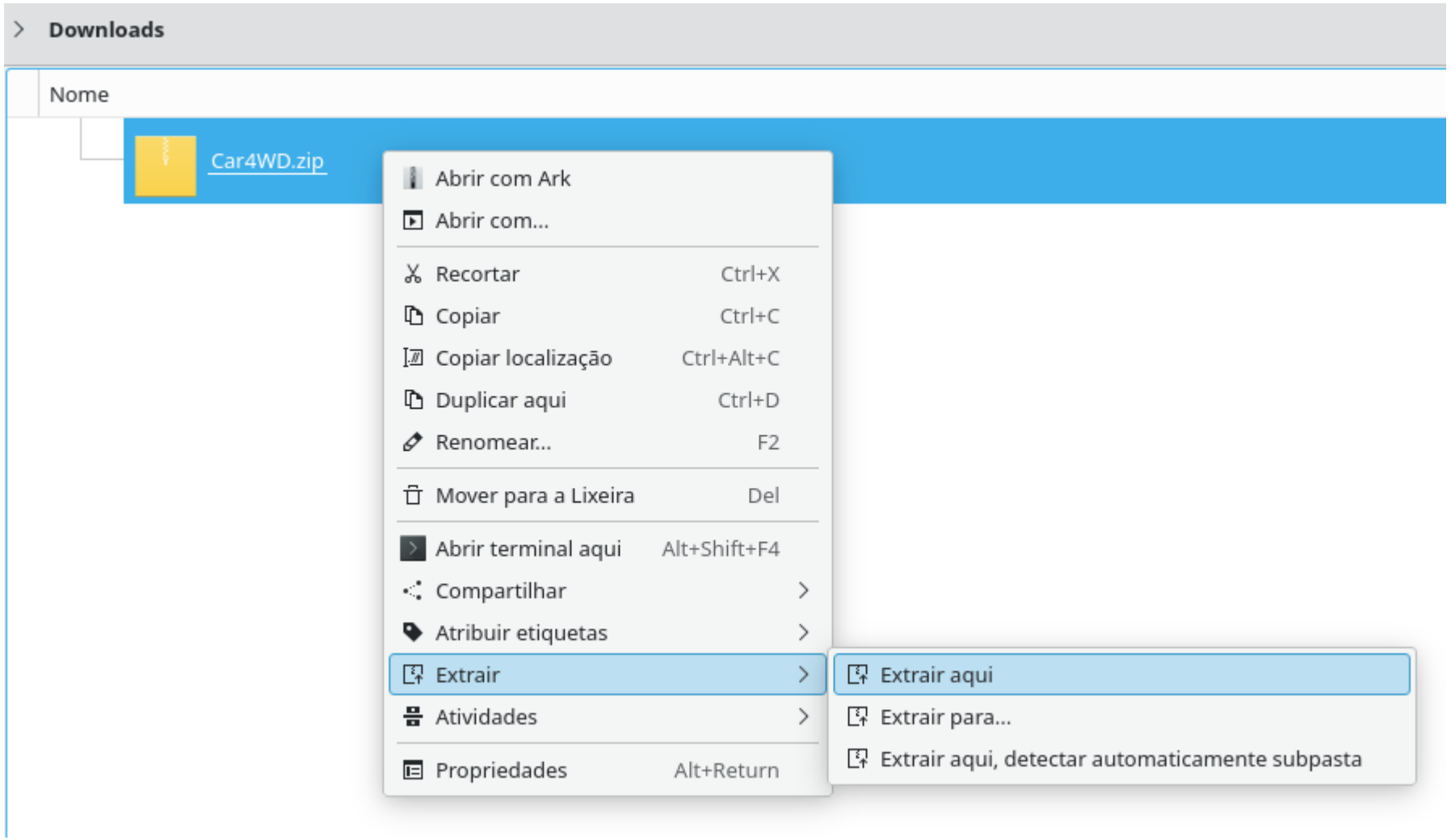
nilsonLazarin Car4WD Simulated World developed by @bptfreitas

Name	Last commit
..	
Blink	developmer
Car4WD	Car4WD Sim
Blink.zip	developmer
Car4WD.zip	Car4WD Sim

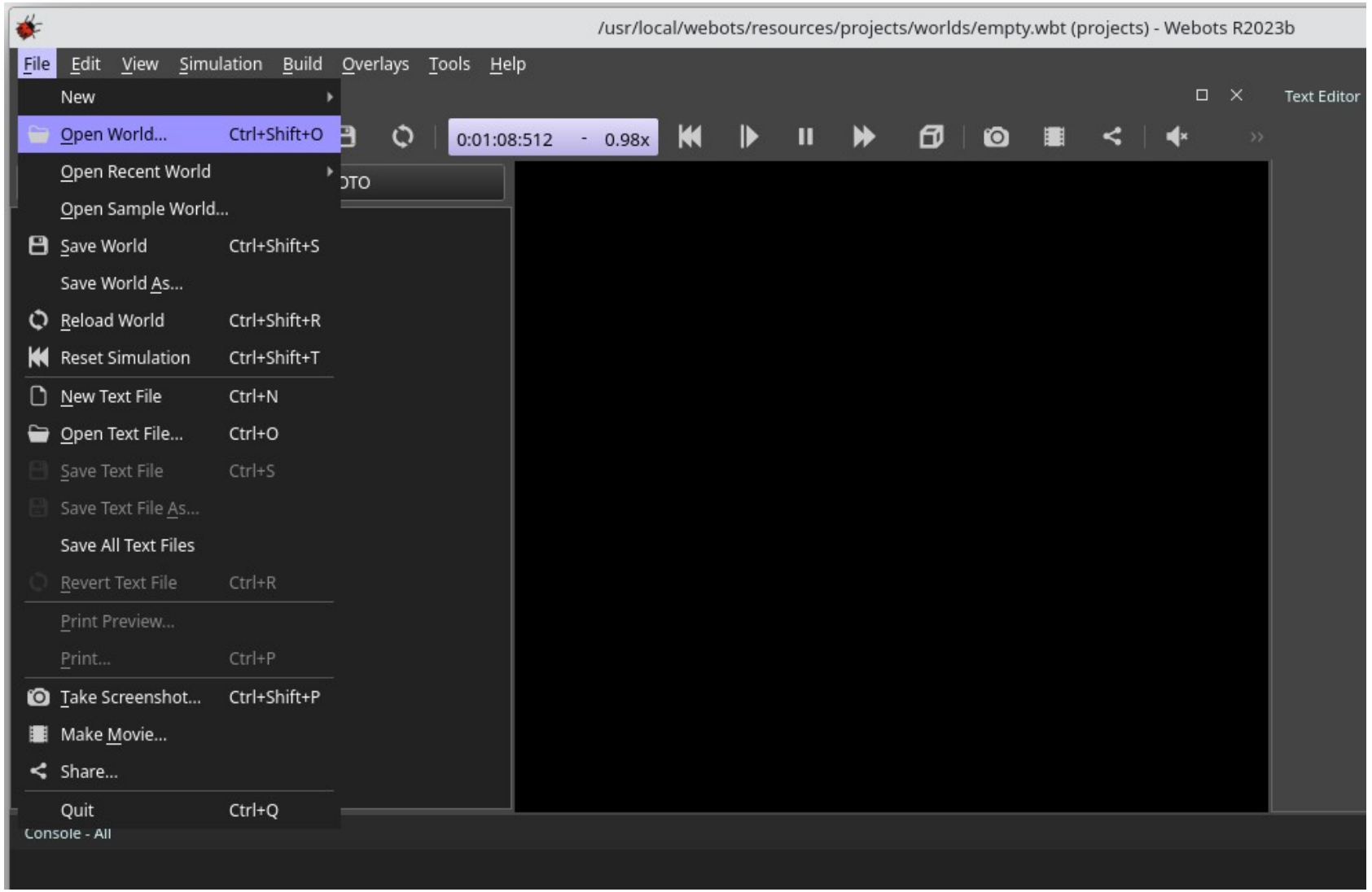


https://github.com/chon-group/distributedAndEmbeddedAI/raw/main/course/05-TheDevelopmentTool/Examples/Car4WD.zip

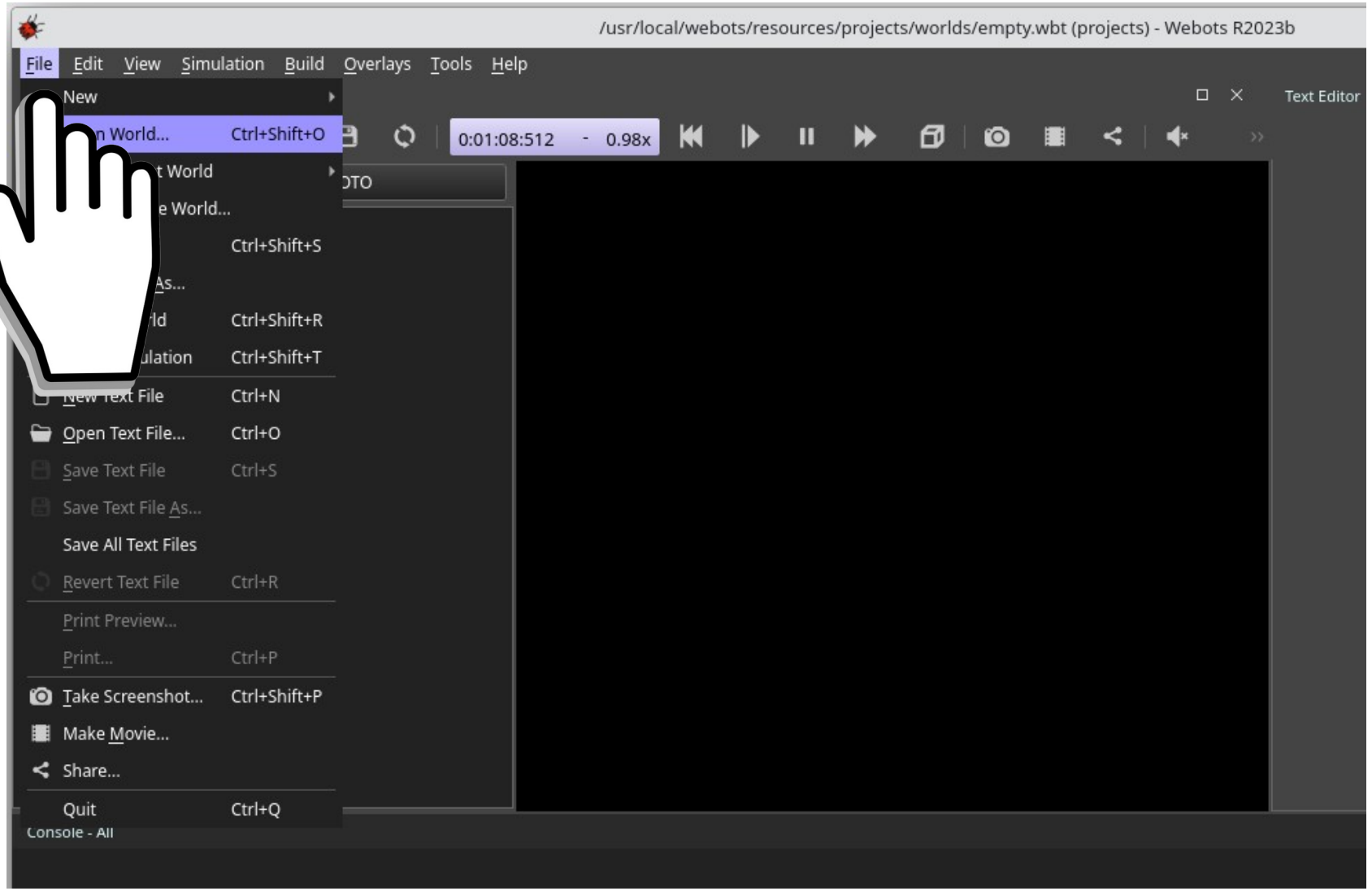
Webots


Downloads
Nome
Car4WD.zip
Abrir com Ark
Abrir com...
Recortar Ctrl+X
Copiar Ctrl+C
Copiar localização Ctrl+Alt+C
Duplicar aqui Ctrl+D
Renomear... F2
Mover para a Lixeira Del
Abrir terminal aqui Alt+Shift+F4
Compartilhar
Atribuir etiquetas
Extrair
Atividades
Propriedades Alt+Return
Extrair aqui
Extrair para...
Extrair aqui, detectar automaticamente subpasta

Webots


/usr/local/webots/resources/projects/worlds/empty.wbt (projects) - Webots R2023b
File Edit View Simulation Build Overlays Tools Help
New
Open World... Ctrl+Shift+O
Open Recent World
Open Sample World...
Save World Ctrl+Shift+S
Save World As...
Reload World Ctrl+Shift+R
Reset Simulation Ctrl+Shift+T
New Text File Ctrl+N
Open Text File... Ctrl+O
Save Text File Ctrl+S
Save Text File As...
Save All Text Files
Revert Text File Ctrl+R
Print Preview...
Print... Ctrl+P
Take Screenshot... Ctrl+Shift+P
Make Movie...
Share...
Quit Ctrl+Q
0:01:08:512 - 0.98x
Text Editor
Console - All

Webots


/usr/local/webots/resources/projects/worlds/empty.wbt (projects) - Webots R2023b
File Edit View Simulation Build Overlays Tools Help
New
Ctrl+Shift+O
Ctrl+Shift+S
Ctrl+Shift+R
Ctrl+Shift+T
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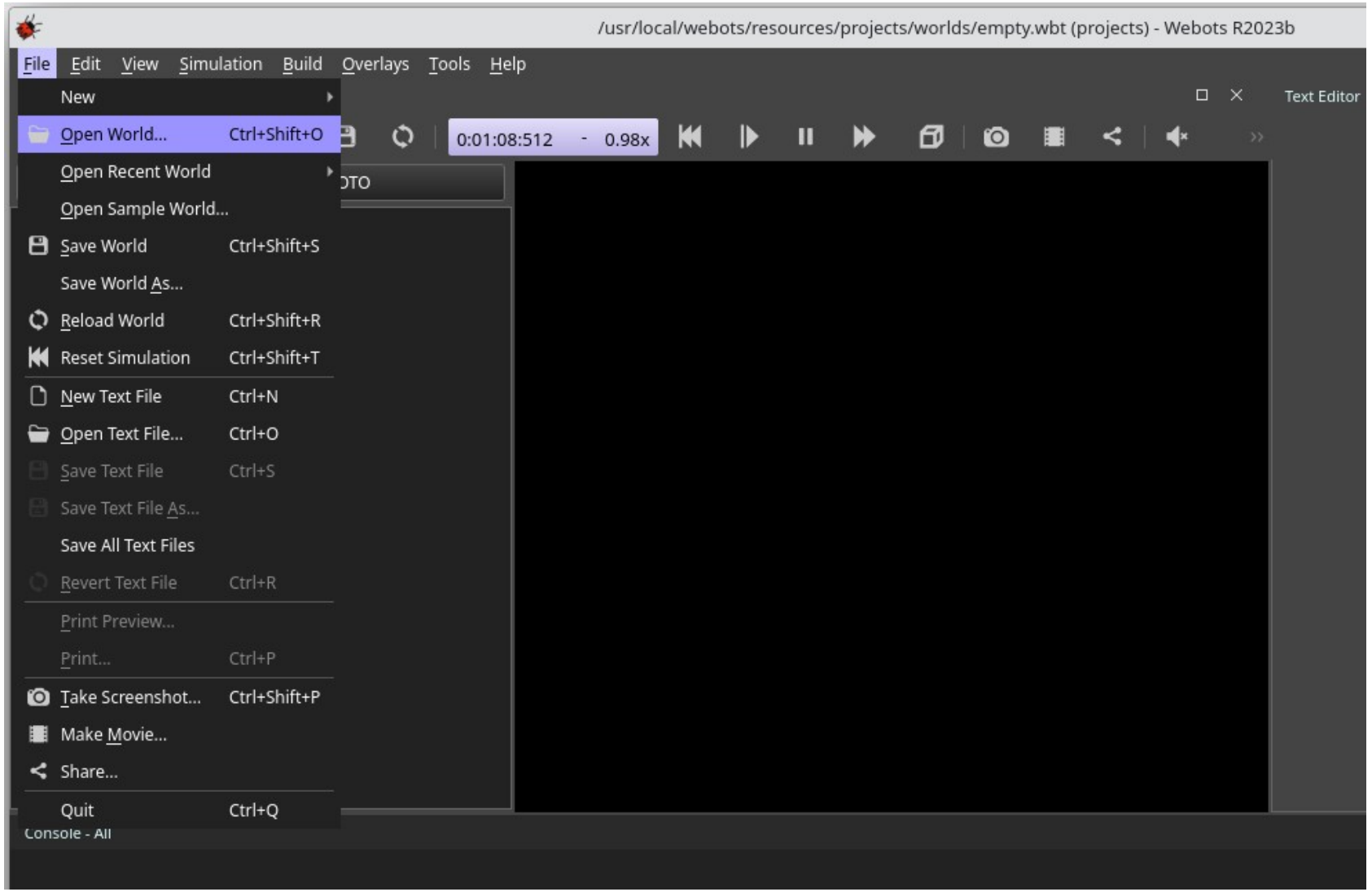
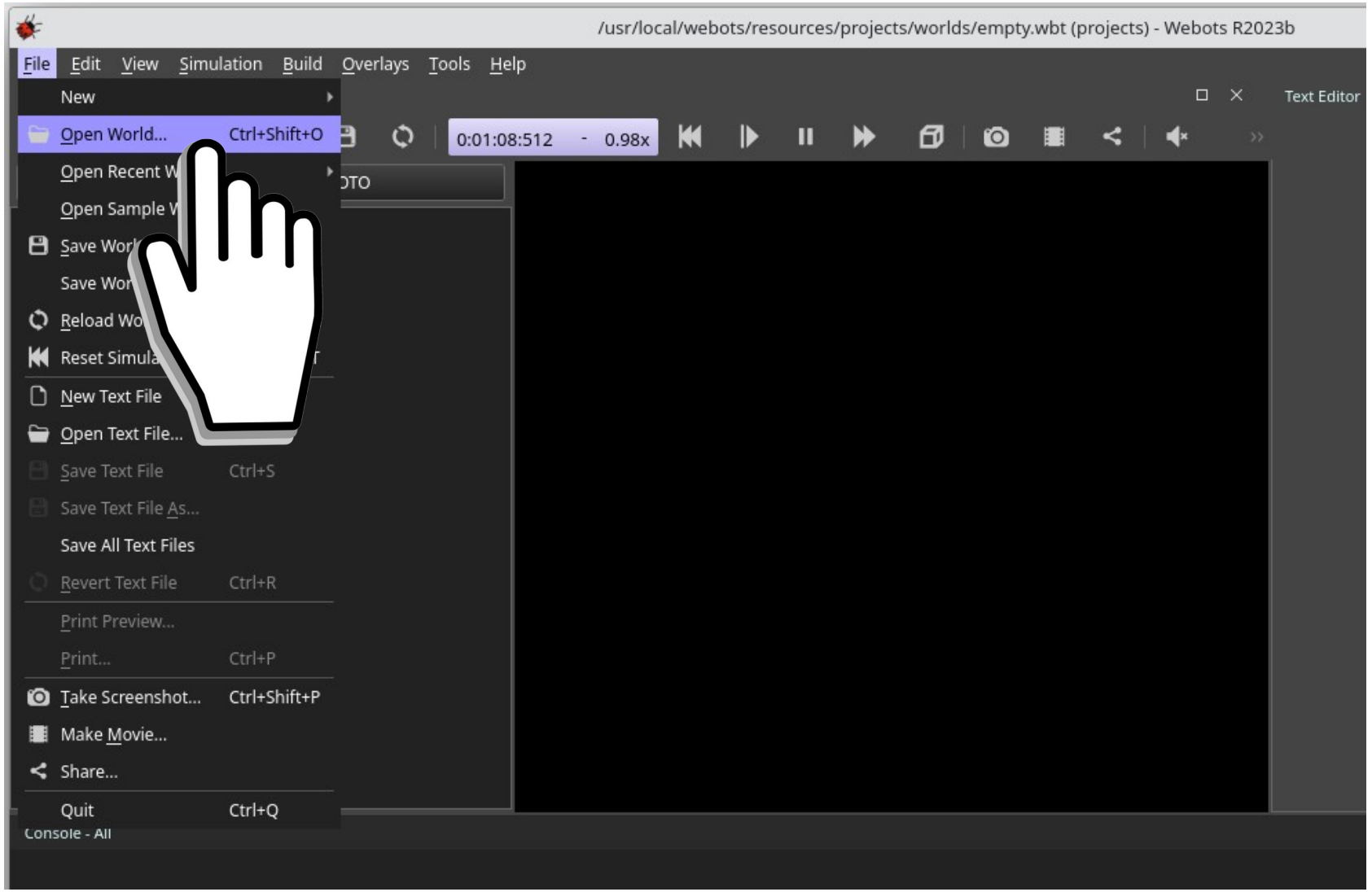
Open Text File... Ctrl+O
Save Text File Ctrl+S
Save Text File As...
Save All Text Files
Revert Text File Ctrl+R
Print Preview...
Print... Ctrl+P
Take Screenshot... Ctrl+Shift+P
Make Movie...
Share...
Quit Ctrl+Q
0:01:08:512 - 0.98x
Text Editor
Console - All

Webots


/usr/local/webots/resources/projects/worlds/empty.wbt (projects) - Webots R2023b
File Edit View Simulation Build Overlays Tools Help
New
Open World... Ctrl+Shift+O
Open Recent World
Open Sample World...
Save World Ctrl+Shift+S
Save World As...
Reload World Ctrl+Shift+R
Reset Simulation Ctrl+Shift+T
New Text File Ctrl+N
Open Text File... Ctrl+O
Save Text File Ctrl+S
Save Text File As...
Save All Text Files
Revert Text File Ctrl+R
Print Preview...
Print... Ctrl+P
Take Screenshot... Ctrl+Shift+P
Make Movie...
Share...
Quit Ctrl+Q
0:01:08:512 - 0.98x
Text Editor
Console - All

Webots


/usr/local/webots/resources/projects/worlds/empty.wbt (projects) - Webots R2023b
File Edit View Simulation Build Overlays Tools Help
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Open World... Ctrl+Shift+O
Open Recent W
Open Sample W
Save Wor
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Reset Simula
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Open Text File...
Save Text File Ctrl+S
Save Text File As...
Save All Text Files
Revert Text File Ctrl+R
Print Preview...
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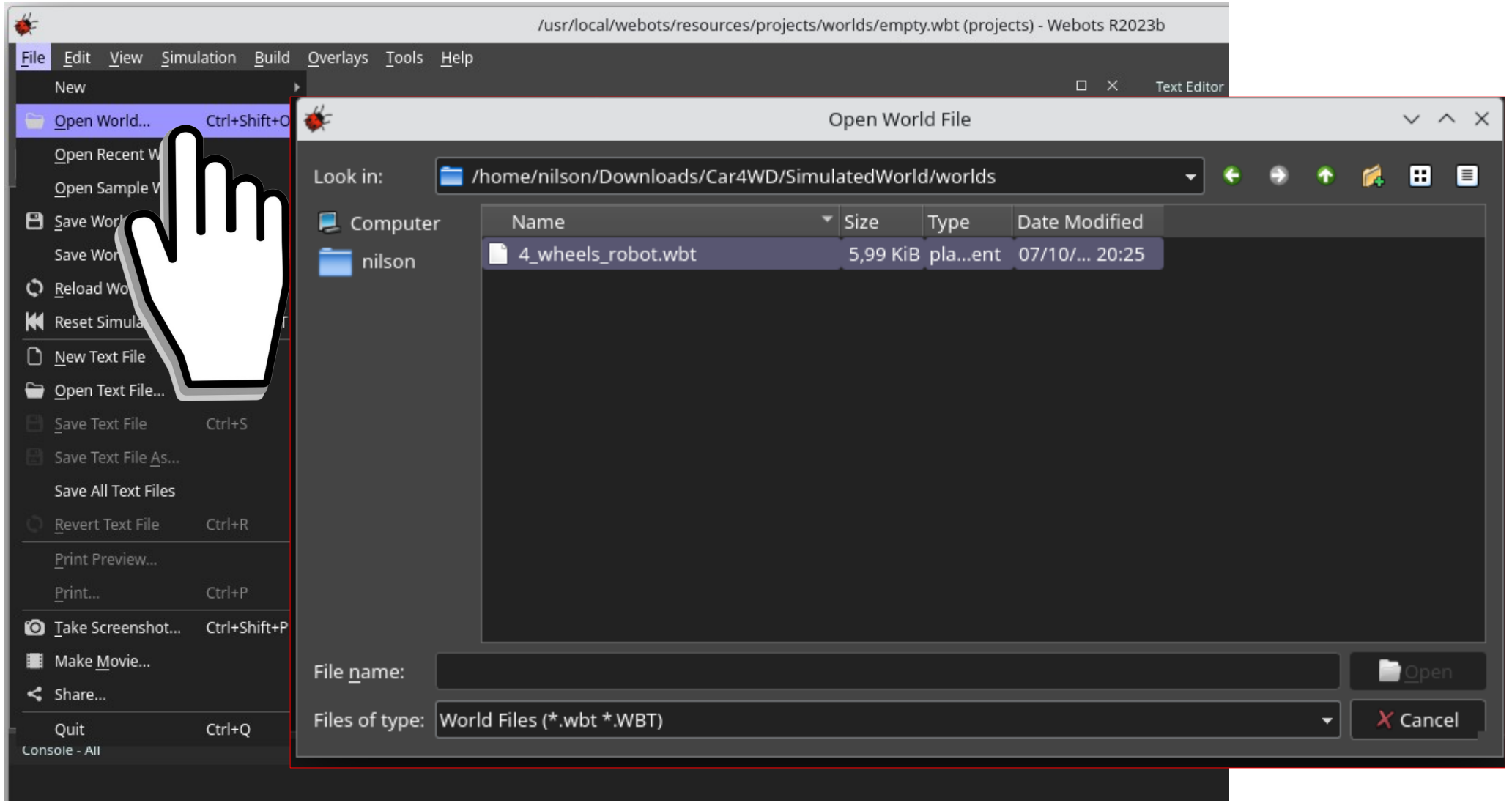
Take Screenshot... Ctrl+Shift+P
Make Movie...
Share...
Quit Ctrl+Q
0:01:08:512 - 0.98x
Text Editor
Console - All

Webots


/usr/local/webots/resources/projects/worlds/empty.wbt (projects) - Webots R2023b
File Edit View Simulation Build Overlays Tools Help
New
Open World... Ctrl+Shift+O
Open Recent W
Open Sample W
Save Wor
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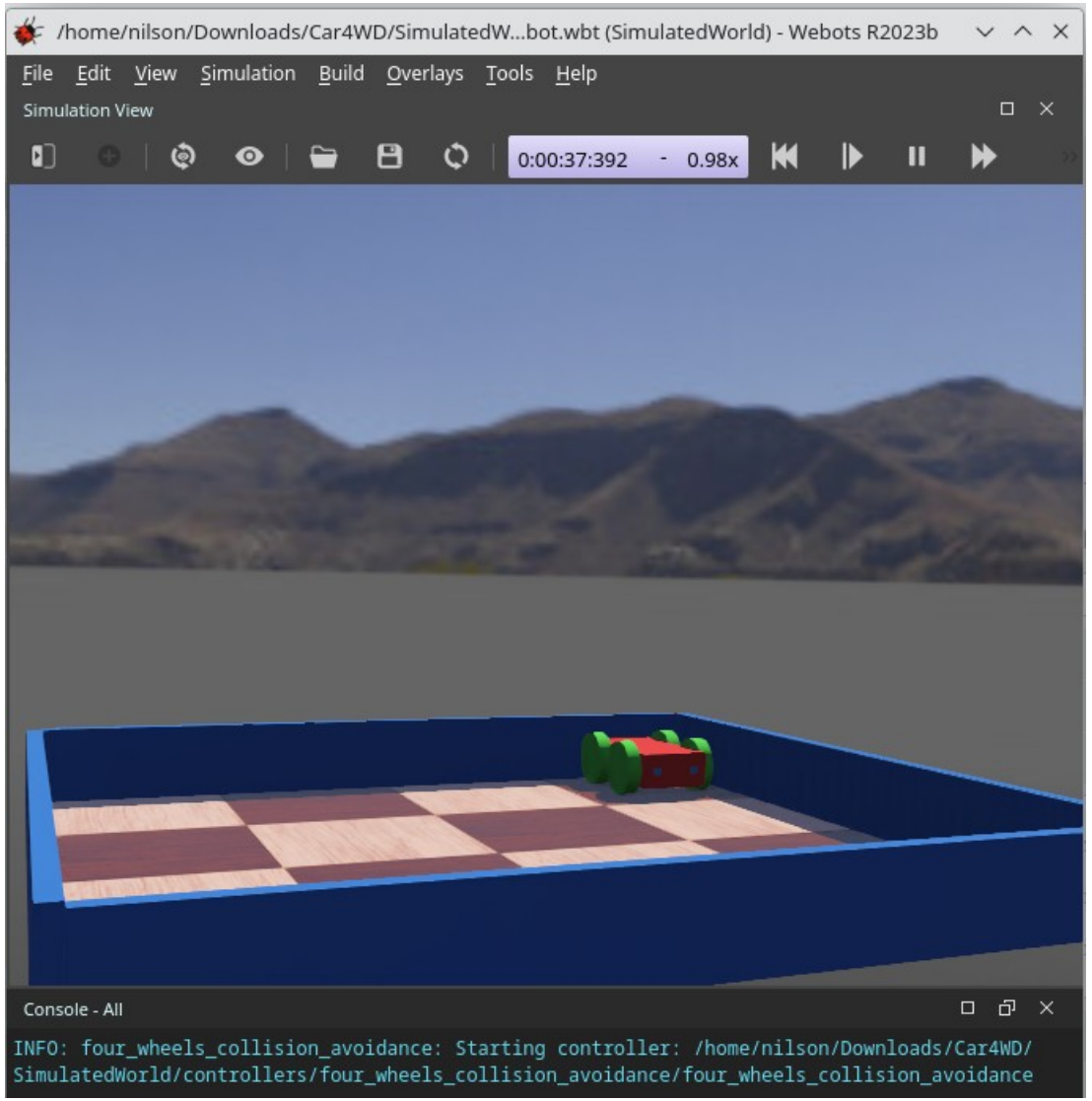
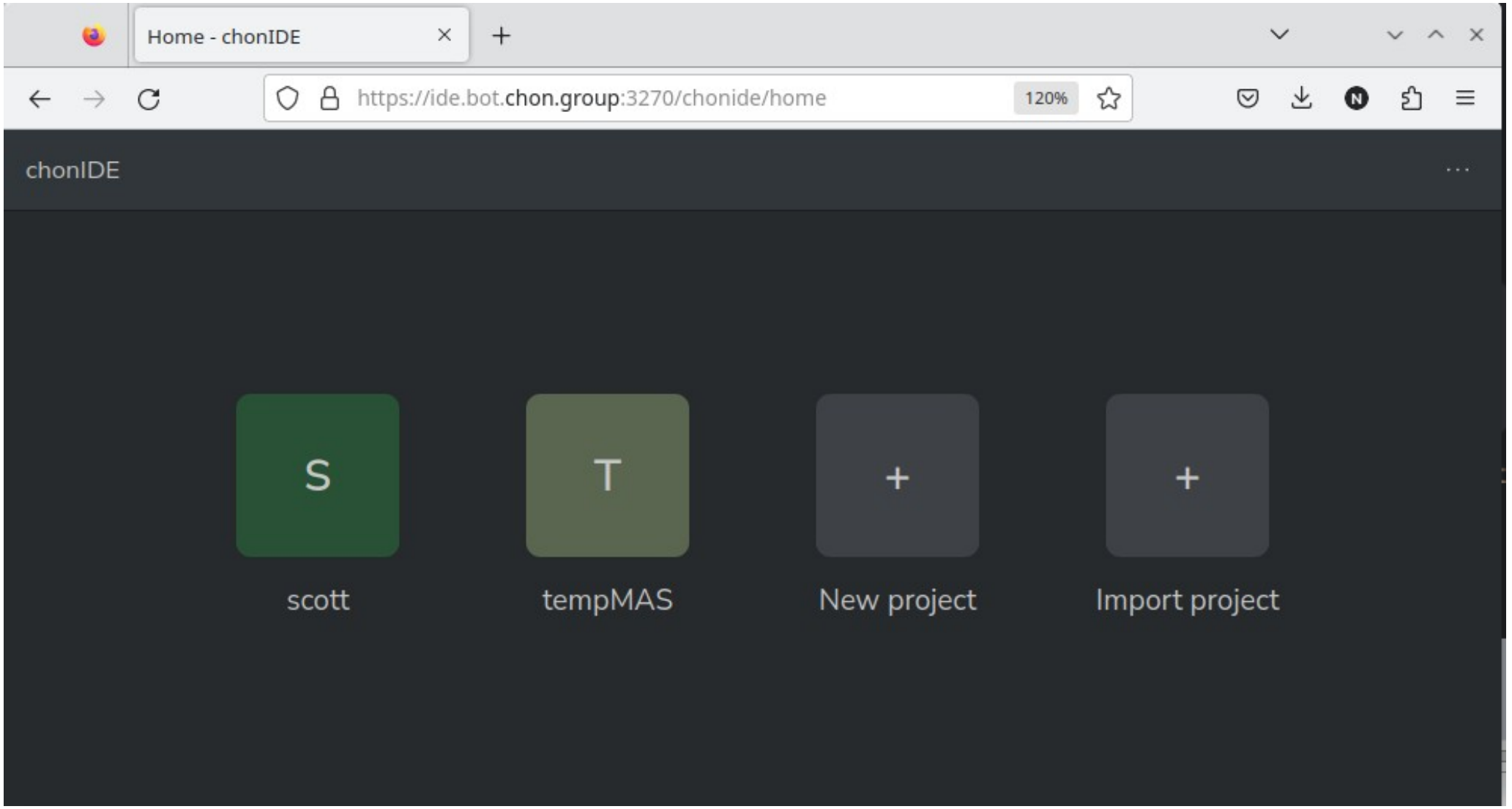
Reload Wo
Reset Simula
New Text File
Open Text File...
Save Text File Ctrl+S
Save Text File As...
Save All Text Files
Revert Text File Ctrl+R
Print Preview...
Print... Ctrl+P
Take Screenshot... Ctrl+Shift+P
Make Movie...
Share...
Quit Ctrl+Q
Console - All
Text Editor
Open World File
Look in: /home/nilson/Downloads/Car4WD/SimulatedWorld/worlds
Computer
nilson
Name Size Type Date Modified
4_wheels_robot.wbt 5,99 KiB pla...ent 07/10/... 20:25
File name:
Open
Files of type: World Files (*.wbt *.WBT)
Cancel

Webots


/home/nilson/Downloads/Car4WD/SimulatedW...bot.wbt (SimulatedWorld) - Webots R2023b
File Edit View Simulation Build Overlays Tools Help
Simulation View
0:00:37:392 - 0.98x
Console - All
INFO: four_wheels_collision_avoidance: Starting controller: /home/nilson/Downloads/Car4WD/SimulatedWorld/controllers/four_wheels_collision_avoidance/four_wheels_collision_avoidance

Webots


Home - chonIDE
https://ide.bot.chon.group:3270/chonide/home
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chonIDE
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T
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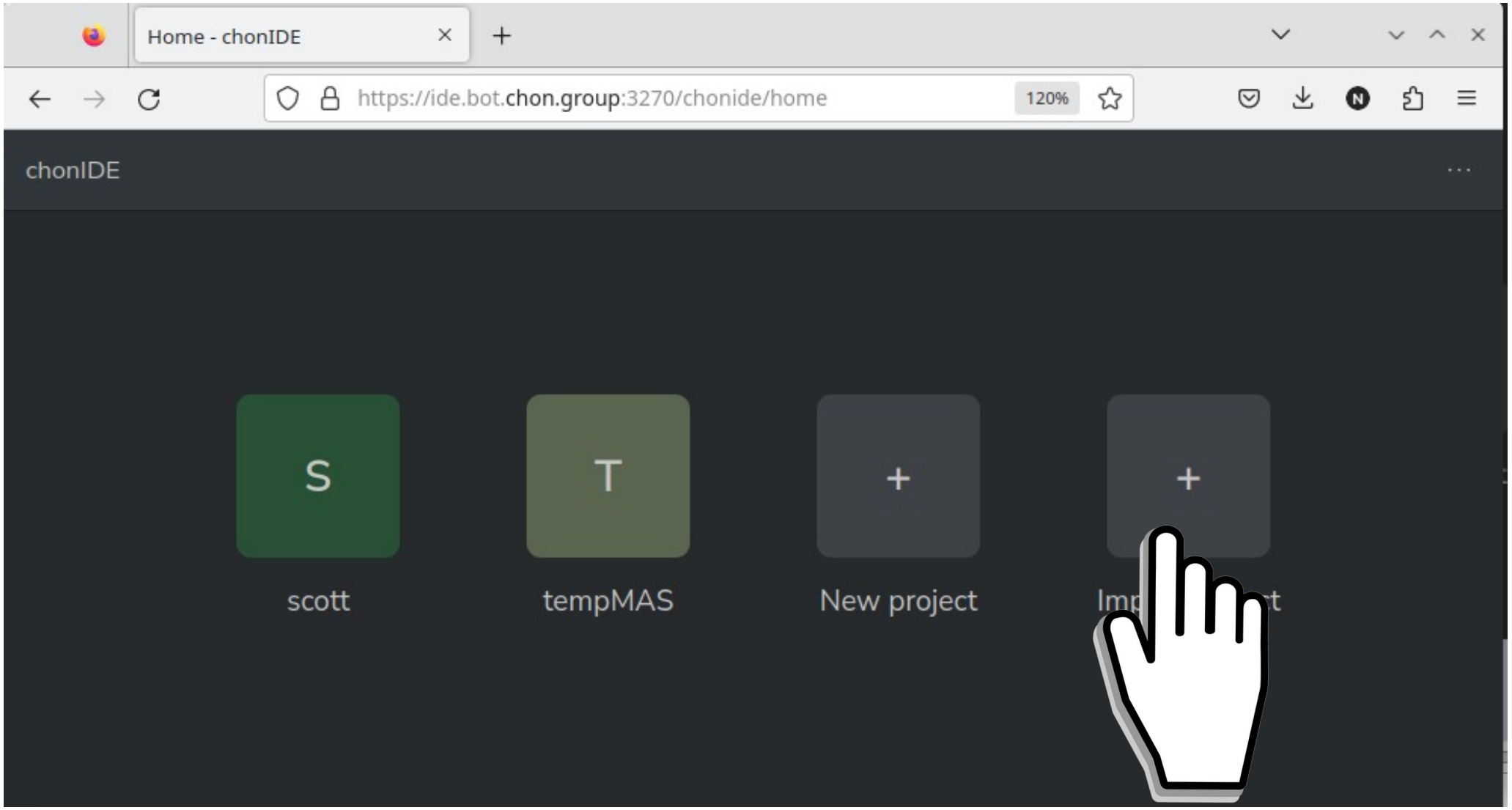
scott
tempMAS
New project
Import project

Webots


Home - chonIDE
https://ide.bot.chon.group:3270/chonide/home
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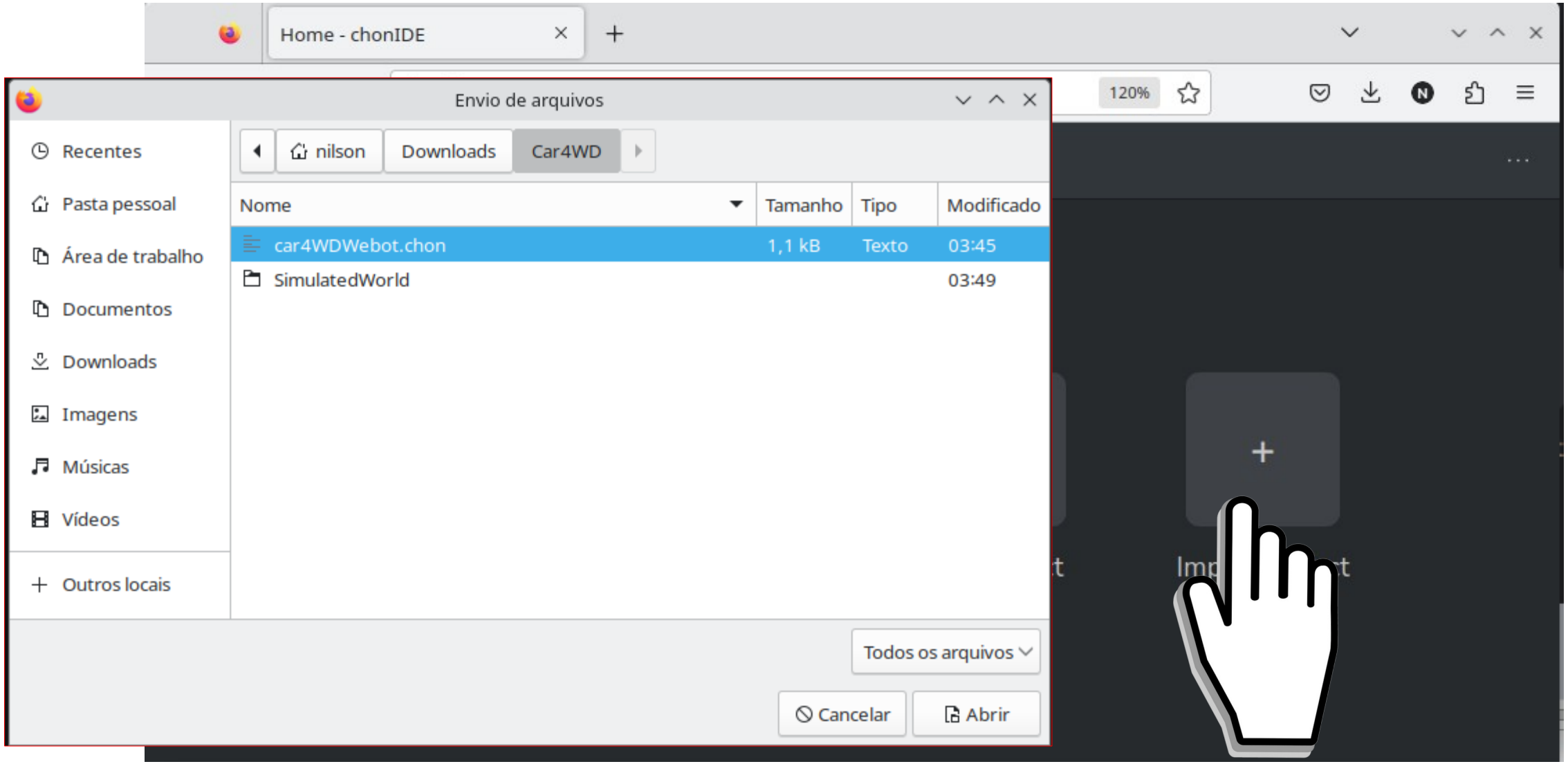
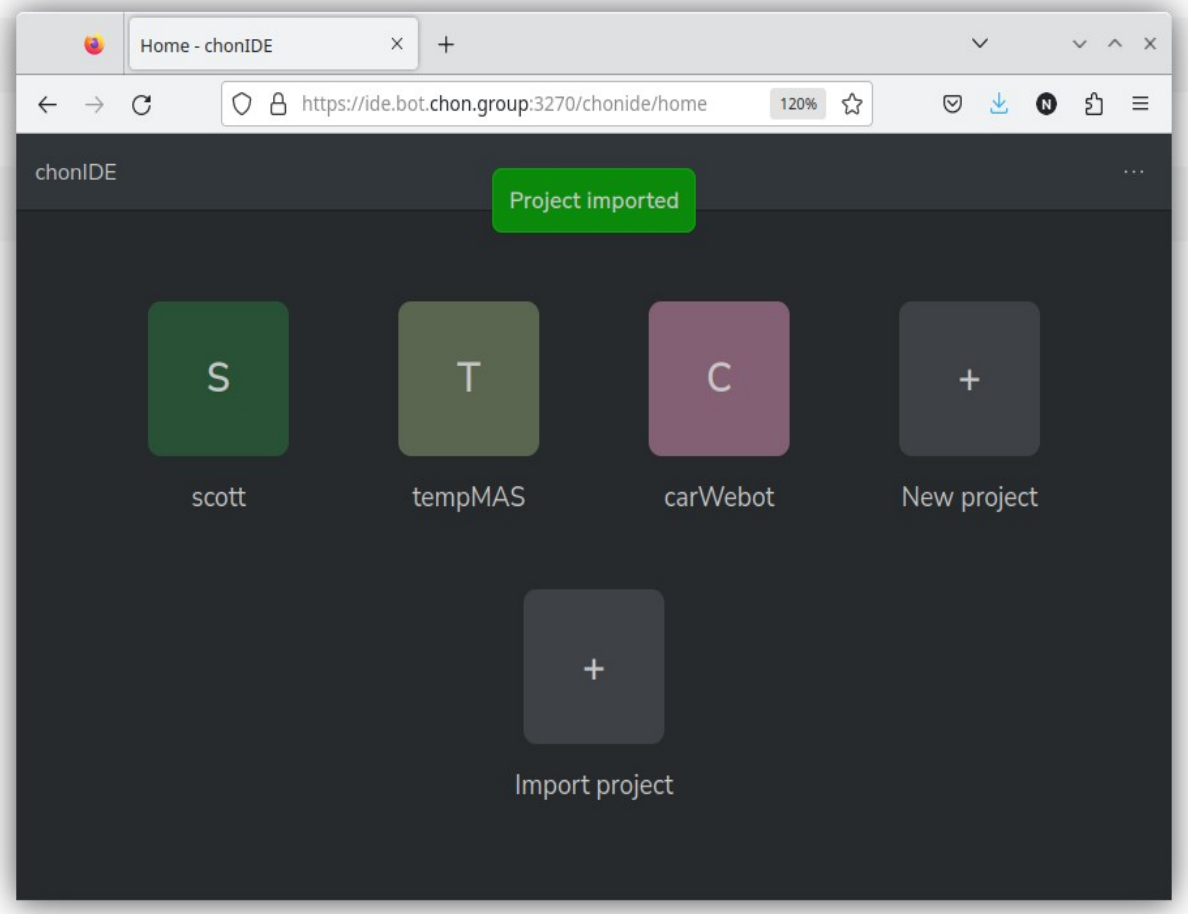
New project

Webots


Home - chonIDE
120%
Envio de arquivos
Recentes
Pasta pessoal
Área de trabalho
Documentos
Downloads
Imagens
Músicas
Vídeos
Outros locais
nilson
Downloads
Car4WD
Nome
Tamanho
Tipo
Modificado
car4WDWebot.chon
1,1 kB
Texto
03:45
SimulatedWorld
03:49
Todos os arquivos
Cancelar
Abrir

Webots


Home - chonIDE
https://ide.bot.chon.group:3270/chonide/home
120%
chonIDE
Project imported
S
T
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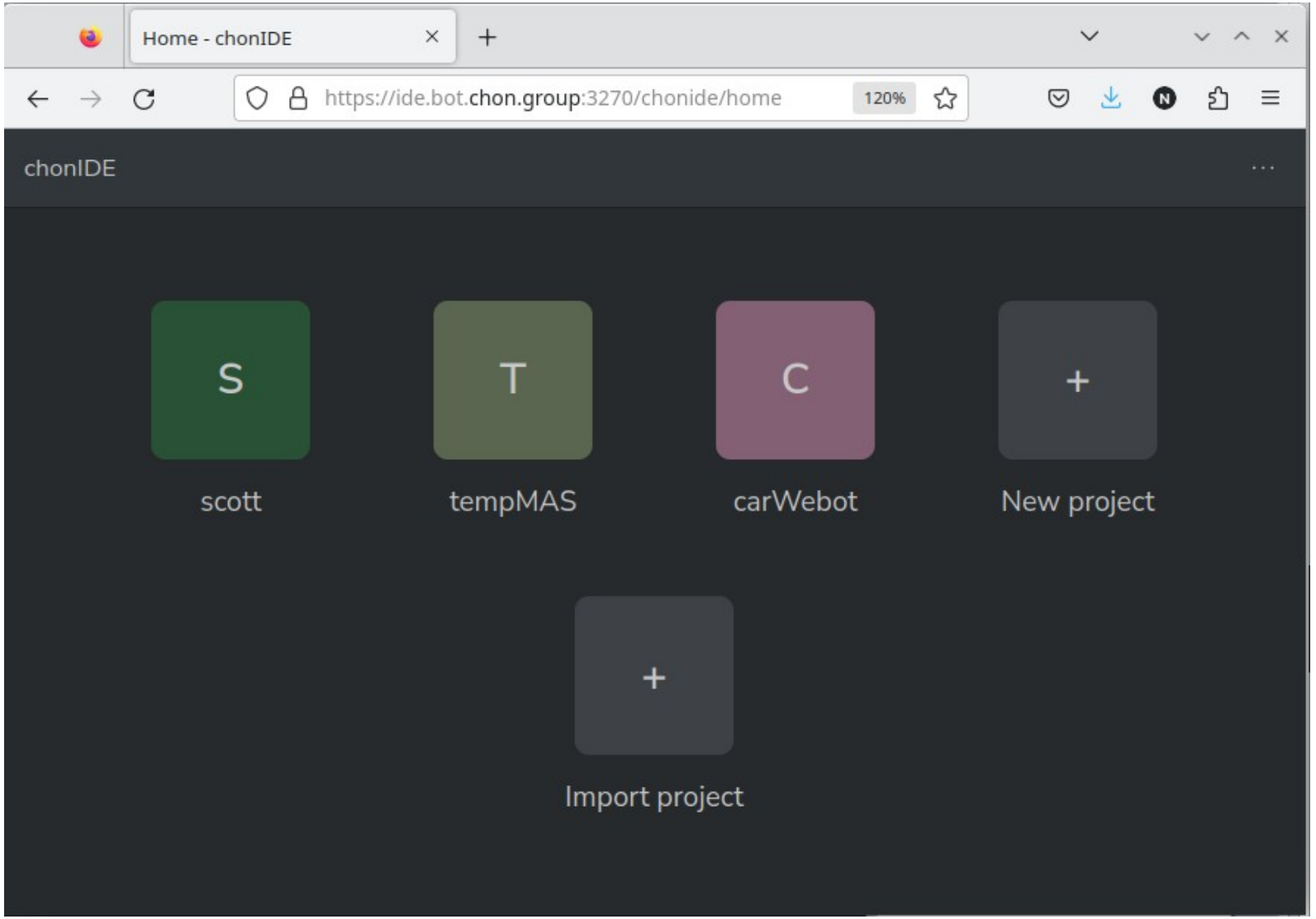
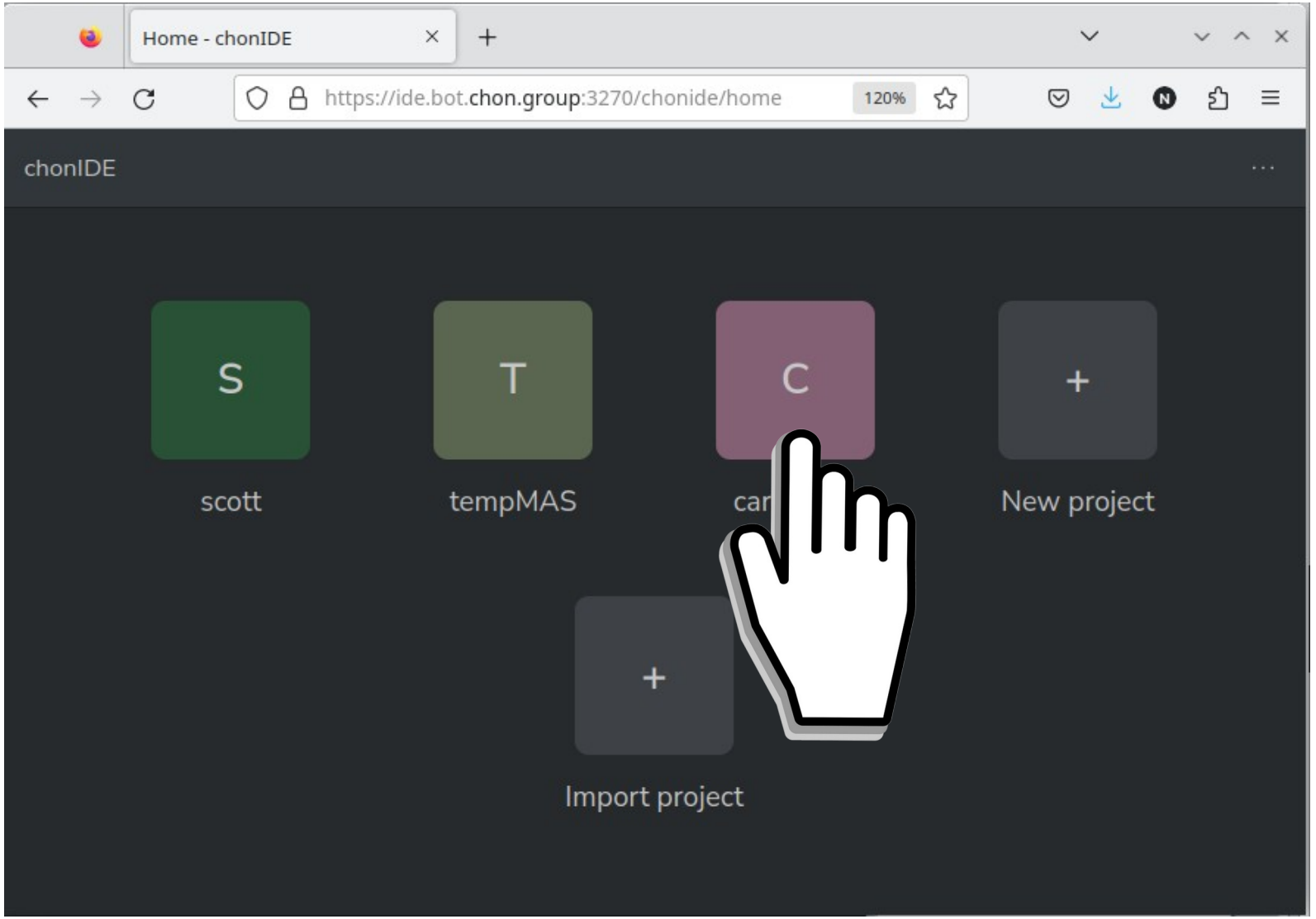
scott
tempMAS
carWebot
New project
+
Import project

Webots


Home - chonIDE
https://ide.bot.chon.group:3270/chonide/home
120%
chonIDE
S
scott
T
tempMAS
C
carWebot
+
New project
+
Import project

Webots


Home - chonIDE
https://ide.bot.chon.group:3270/chonide/home
120%
chonIDE
S
scott
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tempMAS
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New project
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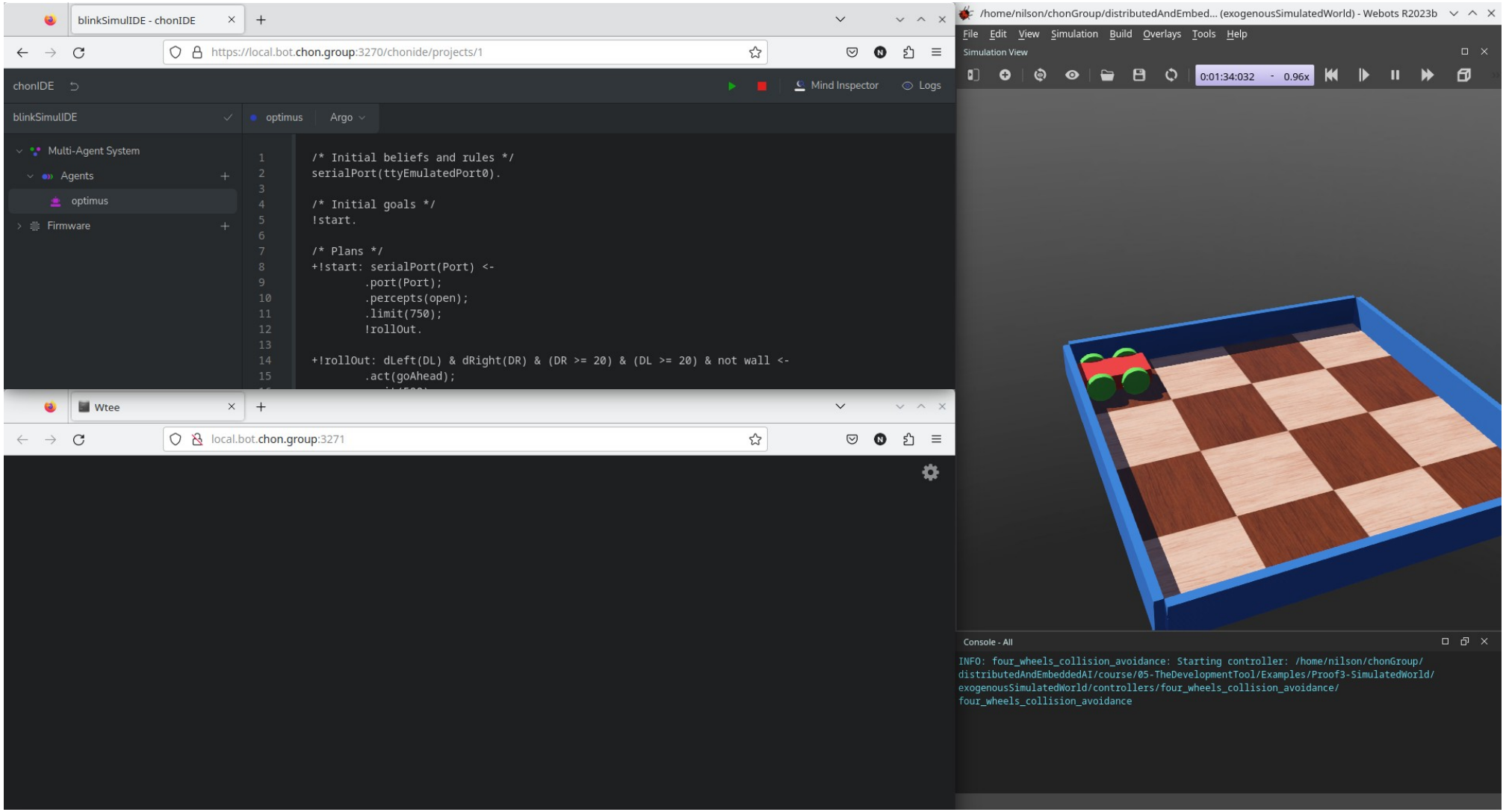
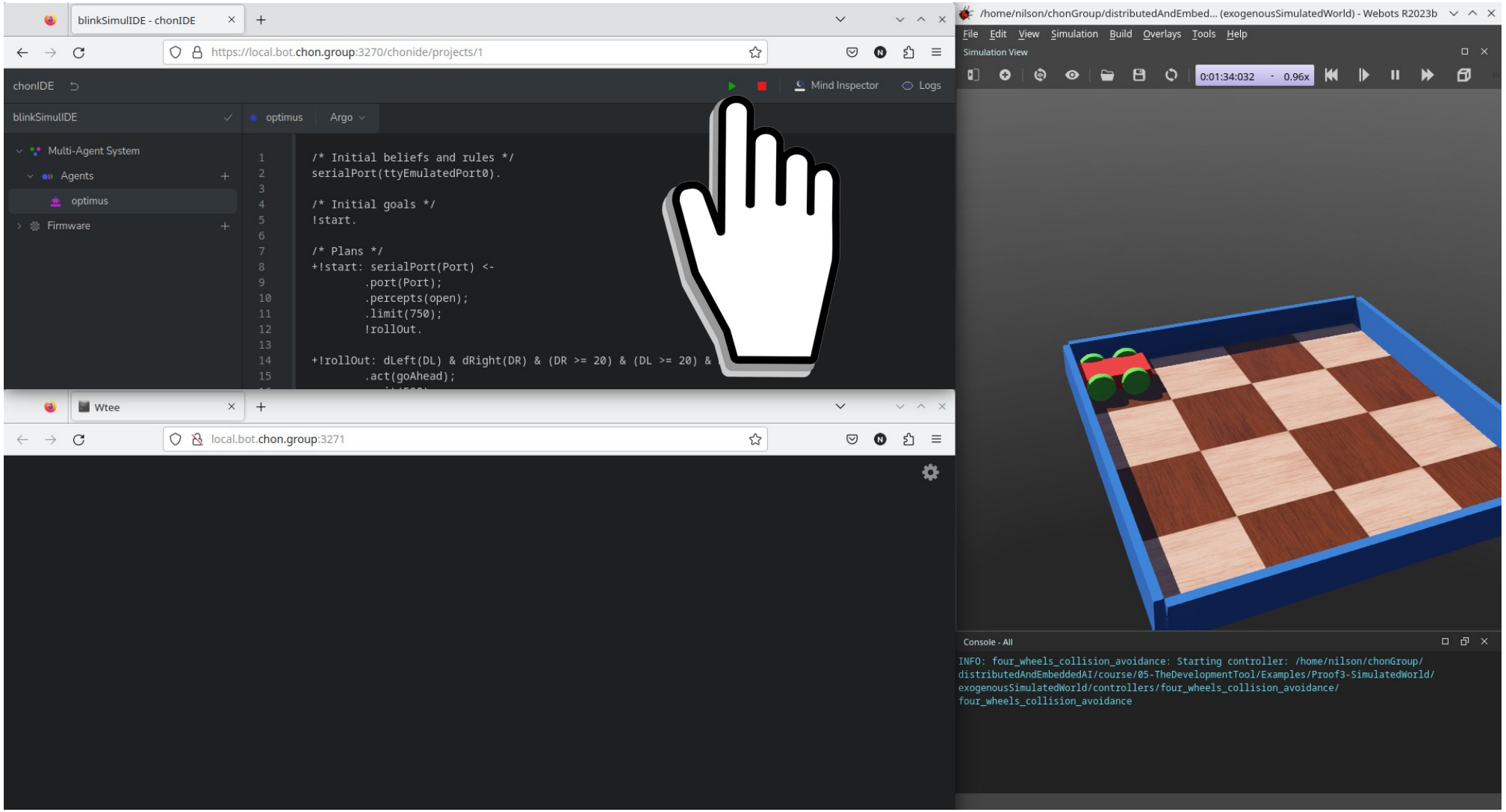
Import project

Webots


blinkSimulIDE - chonIDE
https://local.bot.chon.group:3270/chonide/projects/1
chonIDE
Mind Inspector
Logs
blinkSimulIDE
optimus
Argo
Multi-Agent System
Agents
optimus
Firmware
/* Initial beliefs and rules */
serialPort(ttyEmulatedPort0).
/* Initial goals */
!start.
/* Plans */
+!start: serialPort(Port) <-
.port(Port);
.percepts(open);
.limit(750);
!rollOut.
+!rollOut: dLeft(DL) & dRight(DR) & (DR >= 20) & (DL >= 20) & not wall <-
.act(goAhead);
Wtee
local.bot.chon.group:3271
/home/nilson/chonGroup/distributedAndEmbed... (exogenousSimulatedWorld) - Webots R2023b
File Edit View Simulation Build Overlays Tools Help
Simulation View
0:01:34:032 - 0.96x
Console - All
INFO: four_wheels_collision_avoidance: Starting controller: /home/nilson/chonGroup/
distributedAndEmbeddedAI/course/05-TheDevelopmentTool/Examples/Proof3-SimulatedWorld/
exogenousSimulatedWorld/controllers/four_wheels_collision_avoidance/
four_wheels_collision_avoidance

Webots


blinkSimulIDE - chonIDE
https://local.bot.chon.group:3270/chonide/projects/1
chonIDE
Mind Inspector
Logs
blinkSimulIDE
optimus
Argo
Multi-Agent System
Agents
optimus
Firmware
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.port(Port);
.percepts(open);
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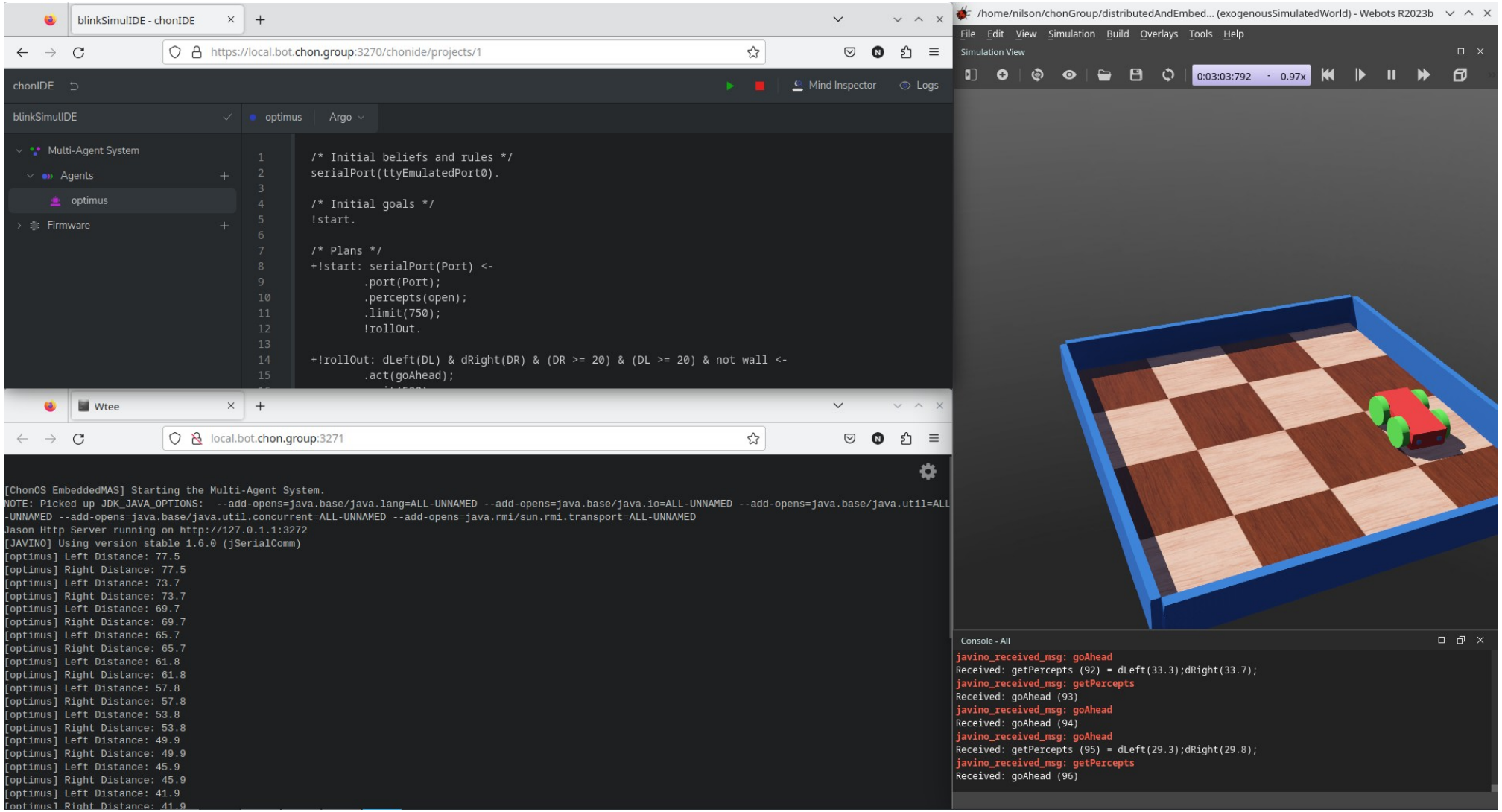
+!rollOut: dLeft(DL) & dRight(DR) & (DR >= 20) & (DL >= 20) &
.act(goAhead);
Wtee
local.bot.chon.group:3271
/home/nilson/chonGroup/distributedAndEmbed... (exogenousSimulatedWorld) - Webots R2023b
File Edit View Simulation Build Overlays Tools Help
Simulation View
0:01:34:032 - 0.96x
Console - All
INFO: four_wheels_collision_avoidance: Starting controller: /home/nilson/chonGroup/distributedAndEmbeddedAI/course/05-TheDevelopmentTool/Examples/Proof3-SimulatedWorld/exogenousSimulatedWorld/controllers/four_wheels_collision_avoidance/four_wheels_collision_avoidance

Webots


blinkSimulIDE - chonIDE
https://local.bot.chon.group:3270/chonide/projects/1
chonIDE
Mind Inspector
Logs
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optimus
Argo
Multi-Agent System
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/* Initial goals */
!start.
/* Plans */
+!start: serialPort(Port) <-
.port(Port);
.percepts(open);
.limit(750);
!rollOut.
+!rollOut: dLeft(DL) & dRight(DR) & (DR >= 20) & (DL >= 20) & not wall <-
.act(goAhead);
Wtee
local.bot.chon.group:3271
[ChonOS EmbeddedMAS] Starting the Multi-Agent System.
NOTE: Picked up JDK_JAVA_OPTIONS: --add-opens=java.base/java.lang=ALL-UNNAMED --add-opens=java.base/java.io=ALL-UNNAMED --add-opens=java.base/java.util=ALL-UNNAMED --add-opens=java.base/java.util.concurrent=ALL-UNNAMED --add-opens=java.rmi/sun.rmi.transport=ALL-UNNAMED
Jason Http Server running on http://127.0.1.1:3272
[JAVINO] Using version stable 1.6.0 (jSerialComm)
[optimus] Left Distance: 77.5
[optimus] Right Distance: 77.5
[optimus] Left Distance: 73.7
[optimus] Right Distance: 73.7
[optimus] Left Distance: 69.7
[optimus] Right Distance: 69.7
[optimus] Left Distance: 65.7
[optimus] Right Distance: 65.7
[optimus] Left Distance: 61.8
[optimus] Right Distance: 61.8
[optimus] Left Distance: 57.8
[optimus] Right Distance: 57.8
[optimus] Left Distance: 53.8
[optimus] Right Distance: 53.8
[optimus] Left Distance: 49.9
[optimus] Right Distance: 49.9
[optimus] Left Distance: 45.9
[optimus] Right Distance: 45.9
[optimus] Left Distance: 41.9
/home/nilson/chonGroup/distributedAndEmbed... (exogenousSimulatedWorld) - Webots R2023b
File Edit View Simulation Build Overlays Tools Help
Simulation View
0:03:03:792 - 0.97x
Console - All
javino_received_msg: goAhead
Received: getPercepts (92) = dLeft(33.3);dRight(33.7);
javino_received_msg: getPercepts
Received: goAhead (93)
javino_received_msg: goAhead
Received: goAhead (94)
javino_received_msg: goAhead
Received: getPercepts (95) = dLeft(29.3);dRight(29.8);
javino_received_msg: getPercepts
Received: goAhead (96)

Agradecimentos

OBRIGADO!

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nilson.lazarin@cefet-rj.br