# [WIP] Infernal Robotics - Next



By Rudolf Meier, February 14, 2018 in Add-on Development

robotics infernal





**Rudolf Meier**

Rocket Scientist

Members
452
750 posts

Posted February 14, 2018 (edited)




We all use and love infernal robotics. It offers great possibilities and adds a very important part of space exploration to the game: robotics. But we all know that there are also limitations and problems with the project. The idea of this project is to solve all those problems and take it to a new level.

Main points of the project:

- major parts of the code will be re-written, made more robust, more efficient and easier to understand
- correct handling of reversals of servos in the editor

as well as in flight during undocking and redocking
- enabling collisions of parts connected with servos
- fixing the problem that parts move away from their original attachement points over time
- minor bugfixes in gui
- adding ik for robotic arms (maybe in an other project)
- ...

One thing that will not work is backwards compatibility. The new version will offer almost the same functionality and almost the same interfaces. But it is already clear, that it cannot offer exactly the same. This is also why a parallel installation of the new version with the old one is planed.

If you do have comments on this, ideas, things you think someone should look into, then please write it in this thread.

The latest beta (almost rc) versions can be found here

https://github.com/meirumeiru/InfernalRobotics/releases

https://github.com/meirumeiru/InfernalRobotics (source code)

It is recommended to use KJR Next with this mod. It is an improved version of original KJR and works correctly with the moving parts of Infernal Robotics and other mods.

[WIP] Kerbal Joint Reinforcement - Next

https://github.com/meirumeiru/Kerbal-Joint-Reinforcement/releases

https://github.com/meirumeiru/Kerbal-Joint-Reinforcement (source code)

the Infernal Robotics Sequencer can be found here

https://github.com/meirumeiru/IR-Sequencer/releases

https://github.com/meirumeiru/IR-Sequencer (source

code)

... but there is also a new development going on for this mod! More info will follow...

the Infernal Robotics Active Struts (a new project using the old models) can be found here

https://github.com/meirumeiru/Active-Struts/releases

https://github.com/meirumeiru/Active-Struts (source code)

This project wouldn't have been possible without the support and help of @ZodiusInfuser

Meiru

Edited April 30 by Rudolf Meier

Quote

You, zer0Kerbal, silentvelcro and 35 others like this

**VR_Dev**

Unity Developer

Members

886

1,034 posts

Posted February 14, 2018 (edited)

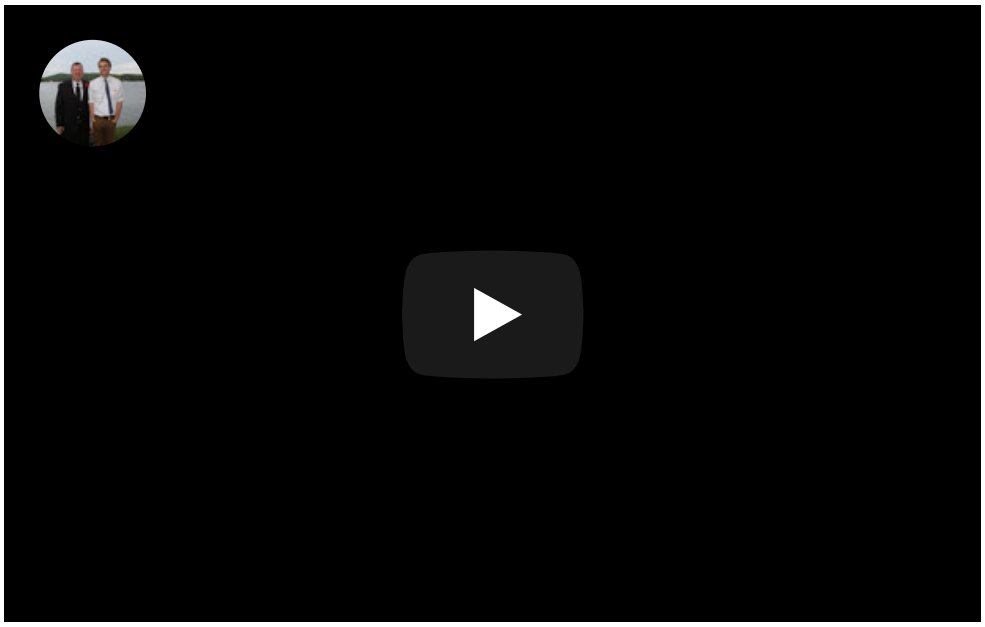
Report post

Ball joints please. Has two settings, rotation and pitch.

Stronger joints. I assume they just use Unity's joints, so not sure how much wiggle room there is there.

Seconded on reverse servos and collisions.

I'm down to help in any way possible, got the IK stuff going already.



Edited February 15, 2018 by VR_Dev

+ Quote

CobaltWolf, SmashingKirby148, Drew Kerman and 4 others like this


**Rudolf Meier**

Rocket Scientist

Members

452

Posted February 14, 2018

Report post

> **On 2/14/2018 at 2:59 PM, VR_Dev said:**
>
> Ball joints please. Has two settings, rotation and pitch.
>
> Stronger joints. I assume they just use Unity's joints, so not sure how much wiggle room there is there.

750 posts

> Seconded on reverse servos and collisions.
>
> I'm down to help in any way possible, got the IK stuff going already.

Thanks for the input...

I did think on ball joints too. From a programming standpoint it's possible... I would have to think about it a bit though. Because unity joints do have 1 very flexible axis and 2 less flexible ones. And we would need models for it. I'm not the model maker and I'd need help from someone for this. But we should continue to talk about that. Do you have good exmaples from real life joints?

What do you mean with stronger joints? Are you talking about the fact that joints start to separate when there's too much load on them (they are not breaking, but you can see a huge gap between the parts)? That's something that should be solved, because I'm already using the unity joints differently than in the original IR.

What's something I'm still experimenting with is the spring forces and torque. We could make some experiments when the first beta is out.

I did program an IK solution for SSRMS like robotic arms (2 in fact, the easier one works, but is not very accurate, the optimized one is implemented, but not tested). But I'd likie to compare what you have with my solution. Maybe we can learn from each other.

+ Quote

VR_Dev likes this

**VR_Dev**

Unity Developer

Posted February 14, 2018

Report post

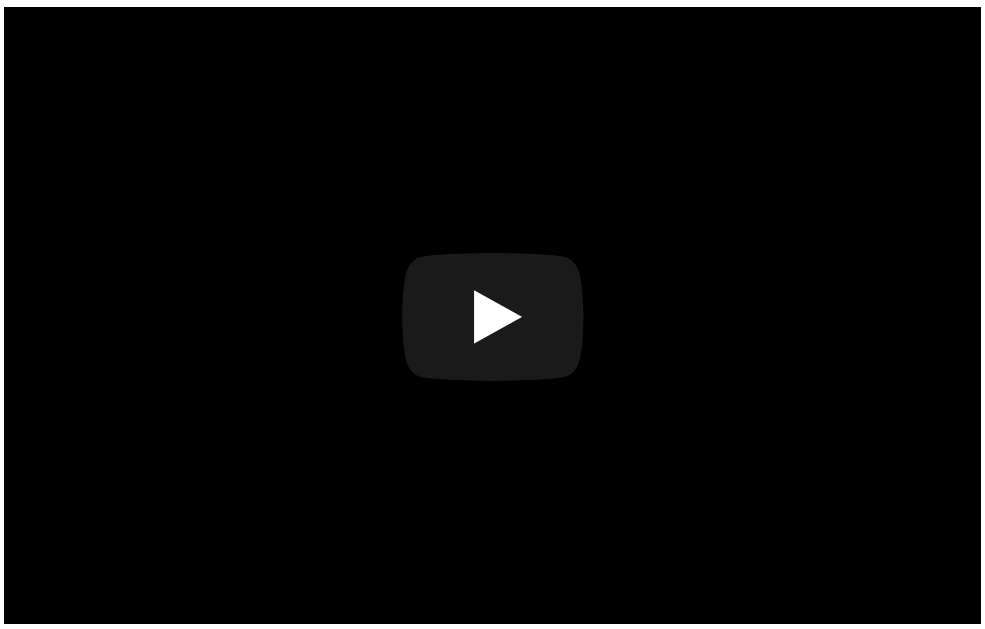
> **On 2/14/2018 at 7:10 PM, Rudolf Meier said:**
>
> Thanks for the input...
>
> I did think on ball joints too. From a programming standpoint it's possible... I would have to think about

Members
886
1,034 posts

> it a bit though. Because unity joints do have 1 very flexible axis and 2 less flexible ones. And we would need models for it. I'm not the model maker and I'd need help from someone for this. But we should continue to talk about that. Do you have good exmaples from real life joints?
>
> What do you mean with stronger joints? Are you talking about the fact that joints start to separate when there's too much load on them (they are not breaking, but you can see a huge gap between the parts)? That's something that should be solved, because I'm already using the unity joints differently than in the original IR.
>
> What's something I'm still experimenting with is the spring forces and torque. We could make some experiments when the first beta is out.
>
> I did program an IK solution for SSRMS like robotic arms (2 in fact, the easier one works, but is not very accurate, the optimized one is implemented, but not tested). But I'd likie to compare what you have with my solution. Maybe we can learn from each other.

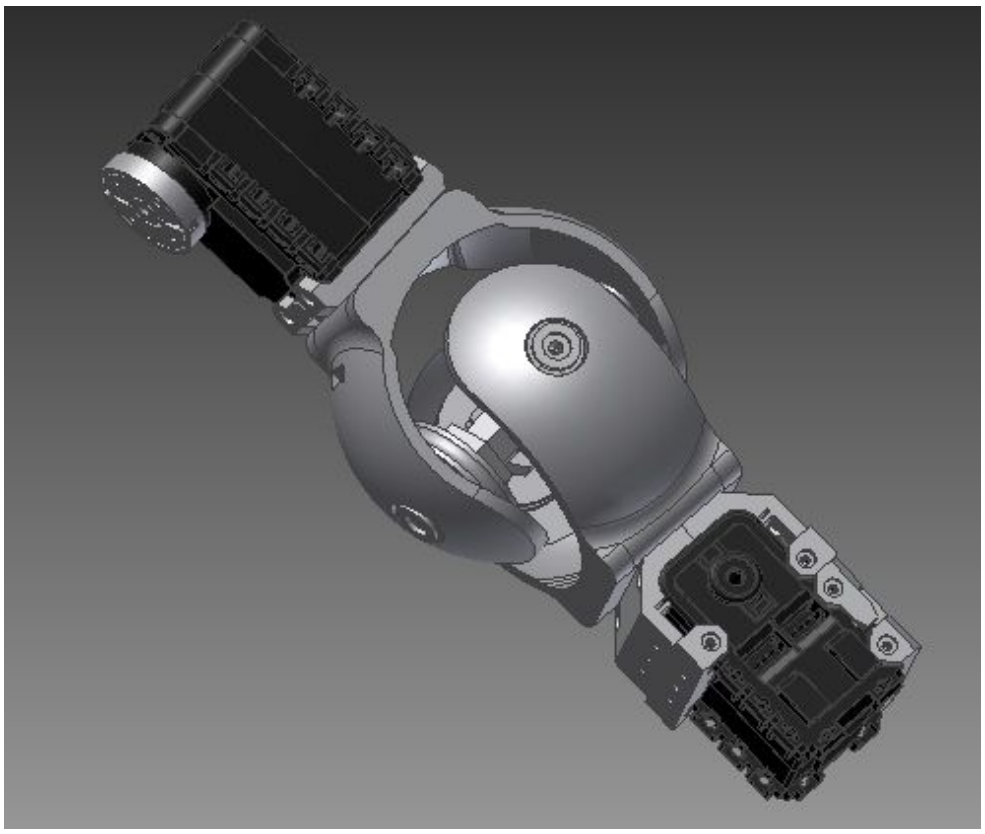
I know Unity and c#, and even how to rig models, but I'm no modeler either. So its a dead end there. I assume you've reached out to @ZodiusInfuser already?

I tried to rig up what my idea for a ball joint would be. Essentially we just need a pivatron with a rotating base, as condensed as possible.



Here are a couple ideas I found. Usually ball joints are not servos, but hey, thats what ksp is for.

This is an interesting idea.



Your standard ball joint. Think of how your shoulder works.

And that's exactly what I mean when I talk about joint strength. If you look at the feet in my video, the blue ball is where the foot is according to the servo angles. The yellow

circle you can often see is where the foot actually is. You obviously already understand this problem, and know how much worse it gets under heavy load.

+ Quote

TheMan2000 and Colonel Cbplayer like this


**Drew Kerman**

KSA Operations Director

Members

1,796

5,331 posts

Posted February 15, 2018

Report post

will def be keeping a close eye on this and rooting for its eventual release!

+ Quote


**Kerbal Space Agency**

@KSA_MissionCtrl 3k

Mods List | Forum Thread

Avatar commissioned from Yorshee

Activ

**ZodiusInfuser**

IRL Doctor of Robotics

Members

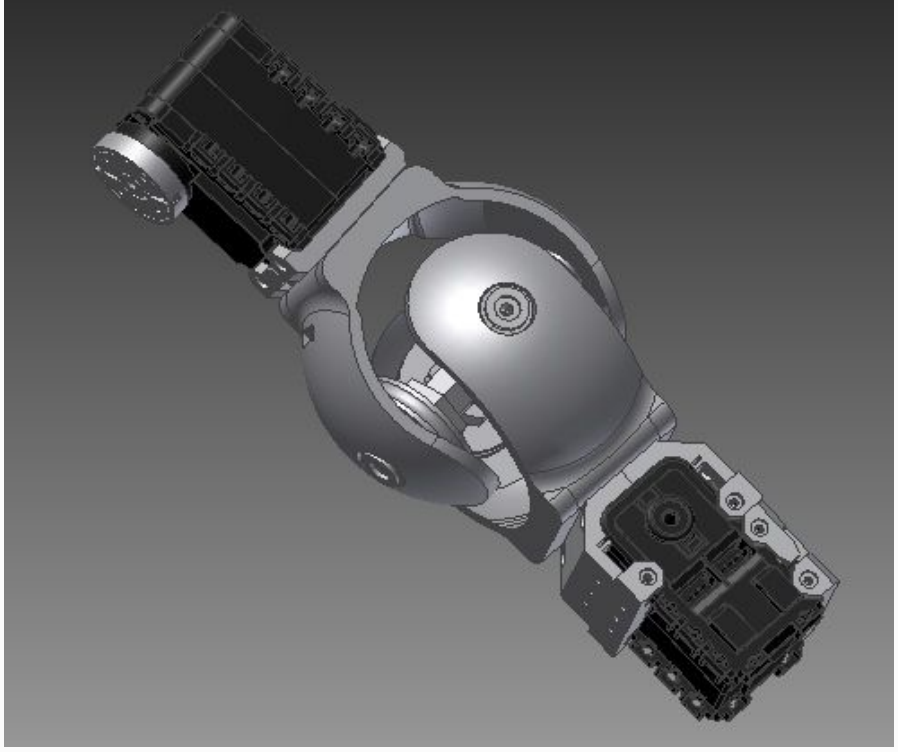
527

1,349 posts

Posted February 15, 2018

Report post

> **On 2/14/2018 at 11:51 PM, VR_Dev said:**
>
> This is an interesting idea.



If you want this mechanism then the two uncontrolled pivotron variants placed back-to-back would achieve that, and I'm sure could be adapted to a single part if the functionality exists.

+ Quote

Infernal Robotics - Next - For all your actuation needs!

**VR_Dev**

Unity Developer

Members

886

1,034 posts

Posted February 15, 2018

Report post

> **On 2/15/2018 at 9:18 AM, ZodiusInfuser said:**
>
> If you want this mechanism then the two uncontrolled pivotron variants placed back-to-back would achieve that, and I'm sure could be adapted to a single part if the functionality exists.

Yeah it would be nice if they were controlled. I guess I'm just interested in multi axis controllable servos for more compact designs. Anything that requires new models will be the most challenging however. I'm down to prioritize internal improvements. I've been meaning to take a look at the IR code, maybe I'll do that this weekend.

+ Quote


**Rudolf Meier**

Rocket Scientist

Members

452

750 posts

Posted February 15, 2018 (edited)

Report post

> **On 2/15/2018 at 12:40 PM, VR_Dev said:**
>
> Yeah it would be nice if they were controlled. I guess I'm just interested in multi axis controllable servos for more compact designs. Anything that requires new models will be the most challenging however. I'm down to prioritize internal improvements. I've been meaning to take a look at the IR code, maybe I'll do that this weekend.

I'm planing to upload the new code this weekend (if I can fix the last obvious bugs). It is almost completely new... just to mention that (I'm working on this for many weeks now).

The idea with the uncontrolled joints is interesting. I'll make some tests... maybe it's an option to build it without the need of new models. On the other side I'm asking myself, if something like a ball-joint does have to be one single joint or if it's ok if it's build from two separate joints... it would be easier for IK, sure... but there are other solutions for that.

Edited February 15, 2018 by Rudolf Meier

+ Quote

**kcs123**

Junior Rocket Scientist

Posted February 15, 2018

Report post

> **On 2/14/2018 at 2:20 PM, Rudolf Meier said:**
>
> enabling collisions of parts connected with servos

Members
768
2,305 posts

Small request, if possible, while you already rewriting large piece of IR code, is i tpossible to expose jointSpring and jointDamping values to right click menu of IR part ?
Reasons for that is in discussion in IR Model rework thread, jsut as reminder if you missed it:

You might also benefit from other WIP mod from @whale_2, as described in this thread:

Can't help you much more than posting links to other mods that share similar ideas.

+ Quote

VR_Dev likes this

**Official FAR Craft Repository** - show off your designes there or ask how to build one.
Craft examples - efficient crafts for FAR: **KCS Space Planes Craft Repository** - redefining term of light and heavy

payload.

**How to use FAR graph when you design craft ?** - click to

## Rudolf Meier

Rocket Scientist

Members

452

750 posts

Posted February 15, 2018 (edited)

Report post

> **On 2/15/2018 at 1:51 PM, kcs123 said:**
>
> Small request, if possible, while you already rewriting large piece of IR code, is i tpossible to expose jointSpring and jointDamping values to right click menu of IR part ? Reasons for that is in discussion in IR Model rework thread, jsut as reminder if you missed it:

Sure... those two values are currently still under investigation (if needed and how they should be set). In case they become important, I will for sure add them to this menu. The behaviour of the joints was sometimes very strange when those values are set wrong. In combination with the internal motor-timing that is used to control the speed I sometimes had massive problems. I do have 2 ideas on how to solve that... but not yet decided which one is the better. Maybe we can figure this out together, when the beta is out (I could implement both ways and testers chan choose the one they like better?).

(the main problem is, that we do have 2 types of movements... the "move to" (e.g. move to 56°) and the "move" (e.g. move right)... if you want to control the acceleration and the speed plus the slowdown in front of a limit (end point)... then it's easier to do this with you own code... but in this case you cannot use the spring/damping values... or they are at least difficult to set)

**Edited February 15, 2018 by Rudolf Meier**

Quote

kcs123 likes this

## whale_2

Stabilizer Of The Old World

Posted February 15, 2018

Report post

Members
289
301 posts

Wow, that's sounds really exciting! IR is fantastic, but there's really much space for improvement.

> **On 2/14/2018 at 7:10 PM, Rudolf Meier said:**
>
> I'm already using the unity joints differently than in the original IR.

Can you please elaborate? The fact the joints behave like rubber also bugs me - they should not do so and I tried to tweak joint parameters to no avail.

> **On 2/14/2018 at 2:20 PM, Rudolf Meier said:**
>
> enabling collisions of parts connected with servos

That's something I'm already doing, however I want to warn that enabling collisions en masse could be CPU-costly and not very convenient. I thought it would be more convenient if there would be a special part like placeholder for internal collisions.

+ Quote

## Rudolf Meier

Rocket Scientist

Members
452
750 posts

Posted February 15, 2018

Report post

> **On 2/15/2018 at 2:09 PM, whale_2 said:**
>
> Wow, that's sounds really exciting! IR is fantastic, but there's really much space for improvement.
>
> Can you please elaborate? The fact the joints behave like rubber also bugs me - they should not do so and I tried to tweak joint parameters to no avail.
>
> That's something I'm already doing, however I want to warn that enabling collisions en masse could be CPU-costly and not very convenient. I thought it would be

> more convenient if there would be a special part like placeholder for internal collisions.

Joints in unity do have 3 axis. You can set them by defining the axis and secondaryaxis. Along those axis you can have a translation (along all 3) and you can have rotations around them. But only for 1 axis (x) you can set the whole set of rotational settings. The other 2 are a little bit restricted. The old code did set the rotation/translation on all axis to "free" or "possible". The new code does set up the configuration differently and does only set 1 of those 6 things to "free". This is more the way it's intended in unity.

The collisions are activated only where needed. The idea is, that you have the same amount of active collision-pairs, that you also have when 2 ships are flying next to each other (while dockign for example). But sure, we have to test it for large configurations.

+ Quote

**kcs123**

Junior Rocket Scientist

Members

768

2,305 posts

Posted February 15, 2018

Report post

> **On 2/15/2018 at 2:07 PM, Rudolf Meier said:**
>
> The behaviour of the joints was sometimes very strange when those values are set wrong. In combination with the internal motor-timing that is used to control the speed I sometimes had massive problems. I do have 2 ideas on how to solve that... but not yet decided which one is the better. Maybe we can figure this out together, when the beta is out (I could implement both ways and testers chan choose the one they like better?).

Yep, I understand that there will be always some kind of game/engine limits. Having those on motorized parts might still be impossible/hard to achieve. However, I already experiment with free rotating parts where is no big issue. Except that I need to change values in config files to

adjust it for craft that I currently build. Not very convinient for full public release of mod.

Maybe some kind of tweakable module in part config file ? To be able to choose on what part it can be enabled and on what part not. Free rotating parts would be safe to have such option, with default values of zero, for both values, like it is now in part config file, but optional to have in game menu slider to experimet with. After some beta testing, limits for those can be suggested.

> **On 2/15/2018 at 2:39 PM, Rudolf Meier said:**
>
> The collisions are activated only where needed.

Pretty much this. I already have two possible scenarios. In one where collisions is not wanted, for example in creating aircraft with variable sweep wings, where you clip extendatrons or rotatrons/hinges within wing and hull parts. In other scenario, you may want to restrict movement of othewise free moving parts, without using motors of some kind. Being able to deceide in game should some part is allowed to collide or not and should it collide with only specific other part of craft will be nice to have.



**pellinor**
Miniature Builder

Posted February 15, 2018 Report post

One solution for the wobbliness problem would be to allow multiple servos in one part. So a whole arm would be one part that holds a kinematic chain with several elements. Each degree of freedom in that chain is governed by a servo module. I think Sirkut (the creator of IR) had an

Members
526
940 posts

unfinished prototype for this. I only remember a screenshot, at a time when we did the last code overhaul and he was not very active anymore.

Roverdude's Konstruction pieces are also quite close to this, just with a simpler interface and without the ability to move attached parts.

Since this would need quite a reorganisation of the code (separating the servo from the kinematics-logic), it might fit here.

+ Quote

## Rudolf Meier

Rocket Scientist



Members
452
750 posts

Posted February 15, 2018

Report post

> **On 2/15/2018 at 4:20 PM, kcs123 said:**
>
> Pretty much this. I already have two possible scenarios. In one where collisions is not wanted, for example in creating aircraft with variable sweep wings, where you clip extendatrons or rotatrons/hinges within wing and hull parts. In other scenario, you may want to restrict movement of othewise free moving parts, without using motors of some kind. Being able to deceide in game should some part is allowed to collide or not and should it collide with only specific other part of craft will be nice to have.

Ok, that's something I didn't think about (e.g. F-14 wings), but you're right. Maybe there should be a possibility to disable the 'collision re-enabling' for some servos. My initial goal was always to build a Canadarm-2 and so all my thoughts come from this example. In this case you want the collisions (e.g. when you're moving a space station part towards a docking port... then you want it to collide and dock with this docking port and not move through it).

+ Quote

**sirkut**

Capsule Communicator

●●●●●

Members

✪ 499

2,568 posts

Posted February 15, 2018

Report post

Hey, looking forward to seeing what you have. Once the code is out I'll take a look and maybe help make some parts (i've done the first ones before **ZodiusInfuser** came along and did the Reworks).

I have certainly been inactive for quite some time but I'm very interested in seeing what you accomplished!

+ Quote

ZodiusInfuser, Gorzideudeus, Vince_K and 2 others like this

Want robotic parts?

Download the Magic Smoke Industries Infernal Robotics plugin and parts!

Magic Smoke Industries Infernal Robotics

**Sebastiaz**

Spacecraft Engineer

●●●

Members

✪ 279

191 posts

Posted February 16, 2018 (edited)

Report post

A small question (Sorry if its already been answered). If I were to delete the original infernal robotics. Then install this one (When it is released) Will my craft that had the old IR parts still work. As I am liking the development of this mod, but also want to still use my craft. ^^ Edit: I'm guessing that's the backwards compatibility post?

**Edited February 16, 2018 by Sebastiaz**

+ Quote

*Forgetting about debris since 1893..*

## Vince_K

space architect

Members

52

102 posts

Location: Quebec, Canada

Posted February 16, 2018

Report post

wouha!!! new updates for IR!?! you are my hero! thanks x 10000000000!!!!

Quote

## Rudolf Meier

Rocket Scientist

Members

452

750 posts

Posted February 16, 2018 (edited)

Report post

> **On 2/16/2018 at 4:44 AM, Sebastiaz said:**
>
> A small question (Sorry if its already been answered). If I were to delete the original infernal robotics. Then install this one (When it is released) Will my craft that had the old IR parts still work. As I am liking the development of this mod, but also want to still use my craft. ^^ Edit: I'm guessing that's the backwards compatibility post?

Unfortunatelly not. The changes are too big. At least the way it is built now. But you can install both mods side-by-side.

I'm investigating a way to either convert the save in the game or with a tool (outside the game). But because of the modifications on how the internal joint axis are set, I don't know if that's easily possible.

Maybe it's possible to convert joints when they are in the default position... I will try that as soon as possible.

**Edited February 16, 2018 by Rudolf Meier**

+ Quote

**Sebastiaz**

Spacecraft Engineer

Members

279

191 posts

Posted February 16, 2018

Report post

> **On 2/16/2018 at 7:10 AM, Rudolf Meier said:**
>
> Unfortunatelly not. The changes are too big. At least the way it is built now. But you can install both mods side-by-side.
>
> I'm investigating a way to either convert the save in the game or with a tool (outside the game). But because of the modifications on how the internal joint axis are set, I don't know if that's easily possible.
>
> Maybe it's possible to convert joints when they are in the default position... I will try that as soon as possible.

Ah okay. Thanks for the help!

+ Quote

*Forgetting about debris since 1893..*

**Rudolf Meier**

Rocket Scientist

Members

452

750 posts

Posted February 19, 2018 (edited)

Report post

here it is... a very early alpha version can be found here

http://meiru.square7.ch/reg554ui9wert/GameData131.zip

http://meiru.square7.ch/reg554ui9wert/GameData122.zip

ZodiusInfuser helped to find bugs in the file structures and made an early review... thanks for that

it should be possible to install it side-by-side with the current IR... but at your own risk

in the next days I will add the missing functionality to it and I will upload the source code to github

Edited February 19, 2018 by Rudolf Meier

+ Quote

VR_Dev and theJesuit like this

**VR_Dev**

Unity Developer

●●●●

Members

886

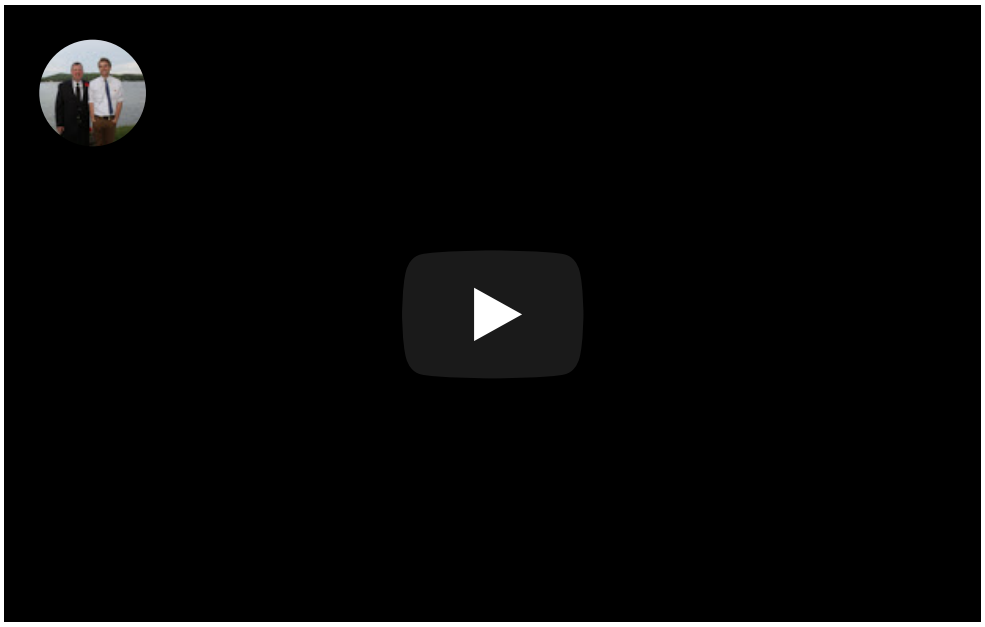
1,034 posts

Posted February 19, 2018 (edited)

Report post

Well would you look at that. Just two weeks ago I was so bummed this configuration wouldnt work with the old servos. Dream come true. Thanks man.

Works in combo with the old IR, just let it overwrite the files.



Edited February 20, 2018 by VR_Dev

+ Quote

ZodiusInfuser and Abpilot like this

**Rudolf Meier**

Rocket Scientist

Members

452

750 posts

Posted February 20, 2018

Report post

> **On 2/15/2018 at 1:51 PM, kcs123 said:**
>
> Small request, if possible, while you already rewriting large piece of IR code, is i tpossible to expose jointSpring and jointDamping values to right click menu of IR part ? Reasons for that is in discussion in IR Model rework thread, jsut as reminder if you missed it:

I found out, that we cannot use limits... that's why we cannot use jointSpring and jointDamping. This is because of the fact that unity doesn't allow values larger than 177° to set a limit and when a joint is loaded in an already turned position you might have to set them to much larger values (e.g. -2 and 350) ... so... I'd have to find other solutions for that.

My question here is (to all): what should a "spring" and "damping" value do on a joint? any ideas what we want here? only on uncontrolled joints?

Quote

**Sebastiaz**

Spacecraft Engineer

Members

279

191 posts

Posted February 20, 2018

Report post

> **On 2/20/2018 at 7:59 AM, Rudolf Meier said:**
>
> I found out, that we cannot use limits... that's why we cannot use jointSpring and jointDamping. This is because of the fact that unity doesn't allow values larger than 177° to set a limit and when a joint is loaded in an already turned position you might have to set them to much larger values (e.g. -2 and 350) ... so... I'd have to find other solutions for that.
>
> My question here is (to all): what should a "spring" and "damping" value do on a joint? any ideas what we want here? only on uncontrolled joints?

Add to the strength of the joint, the rigidness? ^^

+ Quote

*Forgetting about debris since 1893..*

**ZodiusInfuser**

IRL Doctor of Robotics

●●●●

Members

527

1,349 posts

Posted February 20, 2018

Report post

> **On 2/20/2018 at 7:59 AM, Rudolf Meier said:**
>
> My question here is (to all): what should a "spring" and "damping" value do on a joint? any ideas what we want here? only on uncontrolled joints?

Those values in original IR control the internal spring of the joint. By default we only ever used values that meant the spring was at it's extreme (so the servo always matched its target) or at its minimum (so it became uncontrolled). Members did do tested thought of other values and it made things like shock absorbers possible. One idea kcs123 and I discussed was variable elastic actuators, which are special servos IRL that can dynamically adjust their stiffness, hence his suggestion of having the spring values exposed in the VAB (either for all parts or a specific subset)

+ Quote

Infernal Robotics - Next - For all your actuation needs!

Reply to this topic...

GO TO TOPIC LISTING

NEXT UNREAD TOPIC