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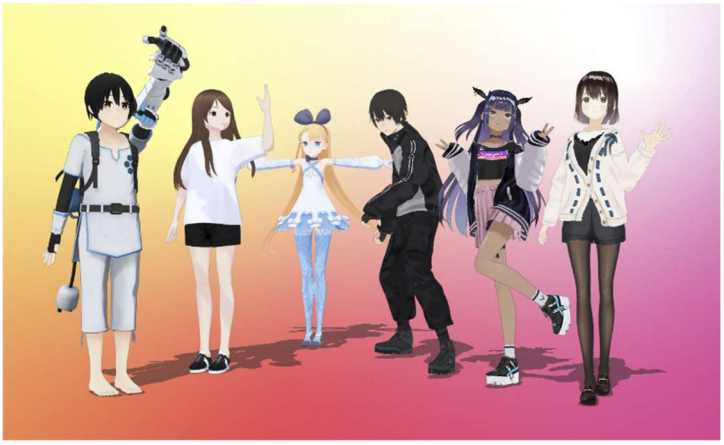

The Current Use of VRM 1.0

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VRM is a standard for humanoid 3D avatars and is well known in Japan. However, when people talk about VRM, they usually mean VRM 0.x, not the official VRM 1.0. VRM 1.0 was released nearly three years ago, but most users are still more familiar with VRM 0.x, since its ecosystem was already well established. Because of this, VRM 1.0 hasn't spread as widely as expected. In this article, we look at the challenges that have affected its adoption.

1. What is VRM

VRM is a set of rules for handling humanoid 3D avatar data, also called the VRM standard or VRM format. It focuses on versatility, allowing avatars to work across different platforms. During the initial planning phase, there was a need to quickly gain recognition before many competing 3D avatar standards appeared. As a result, a beta version called VRM 0.x was released in 2018. Four years later, in

2022, the official version VRM 1.0 came out and is now the current standard.

VRM is intended for use in applications like the metaverse and virtual YouTubers (VTubers). In practice, VRM avatars are already used on the cluster, Japan's largest domestic metaverse platform.

The official organization behind VRM is the VRM Consortium, a general incorporated association that plays a central role in drafting and maintaining the standard.

Besides VRM, there are other 3D avatar formats such as glTF, which serves as a base specification, and FBX, a widely used global format. There are also OBJ and COLLADA (.dae), which are used internationally. Among these, VRM is specialized for humanoid 3D characters and designed with Japanese anime culture in mind. As a result, it is mostly recognized within Japan. However, through collaboration with the U.S.-based KHRONOS Group, VRM is aiming to expand its adoption worldwide.

2. Current State of VRM 1.0

As mentioned earlier, the official version of VRM is VRM 1.0. However, many users still rely on the beta version, VRM 0.x, and in some cases even mistakenly regard it as the official standard. The VRM Consortium is working to promote the adoption of VRM 1.0. But since VRM 0.x was released earlier, most existing VRM applications and tools still support the older version. Even if a tool has not yet been updated for VRM 1.0—which contains significant specification changes—there are almost no cases where VRM 0.x cannot be used. For this reason, many creators continue to choose VRM 0.x, prioritizing stability.

Although VRM is designed for use in the metaverse, VRChat, which has one of the largest user bases, does not natively support VRM. That said, VRM avatars can be converted for use in VRChat through Unity-based tools. However, many of the new features introduced in VRM 1.0 are difficult to reproduce in VRChat avatars. As a result, the source format for conversion is generally limited to VRM 0.x—another factor that discourages creators from producing VRM 1.0 format.

On the other hand, the Japanese metaverse platform the cluster, which initially supported only VRM 0.x, now also supports VRM 1.0. Features such as

constraints and inside colliders function properly, making the cluster one of the few platforms where VRM avatars can fully leverage the capabilities of VRM 1.0.

That said, the cluster emphasizes lowering the barrier of entry for users. As a result, many users who bring their own avatars rely on VRoid Studio, which means that in practice the advanced features of VRM 1.0 are rarely utilized.

VRoid Studio can export avatars in VRM 1.0 format (and in the latest version, VRM 1.0 is the default export format—so be mindful of this). However, the unique features of VRM 1.0 cannot be showcased directly within VRoid Studio itself. To take advantage of them, creators need to use Blender or Unity, which raises the technical barrier.

That being said, VRoid Studio remains a revolutionary tool. Even users without prior 3D CG knowledge can create avatars through intuitive operations, and it is free of charge. Its existence continues to provide strong foundational support for VRM users to this day.

3. Technical Factors Hindering the Adoption of VRM 1.0

VRM 1.0 excels at reproducing natural avatar movements, but it has limited backward compatibility. For example, in environments optimized for VRM 0.x, differences in shaders can cause VRM 1.0 avatars to look different from the intended appearance.

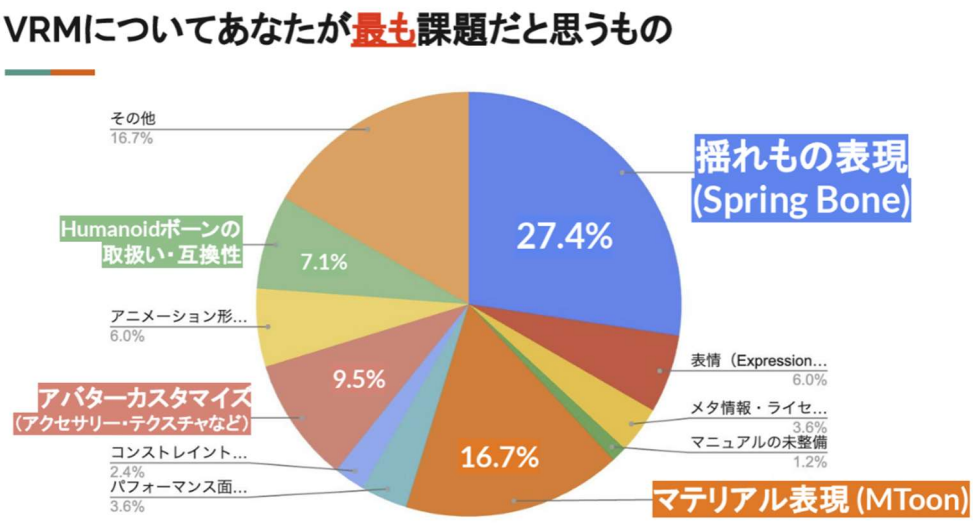
In the cluster worlds, it often happens that VRM1.0 avatars appear overly exposed, with their colors washed

out. However, with VRM0.x avatars, they are usually rendered correctly.

Confusion has also arisen due to the redefinition of blend shapes (shape keys) as Expressions in VRM 1.0.

For spring bones and other secondary (physics-based) motion, the specifications were significantly changed. This has made configuration more complex and negatively affected creators' impressions of VRM 1.0.

Not long ago, the VRM Consortium conducted a survey on challenges facing VRM, and the results were published (a link to the image is provided below).



(Sorry for providing this in Japanese)

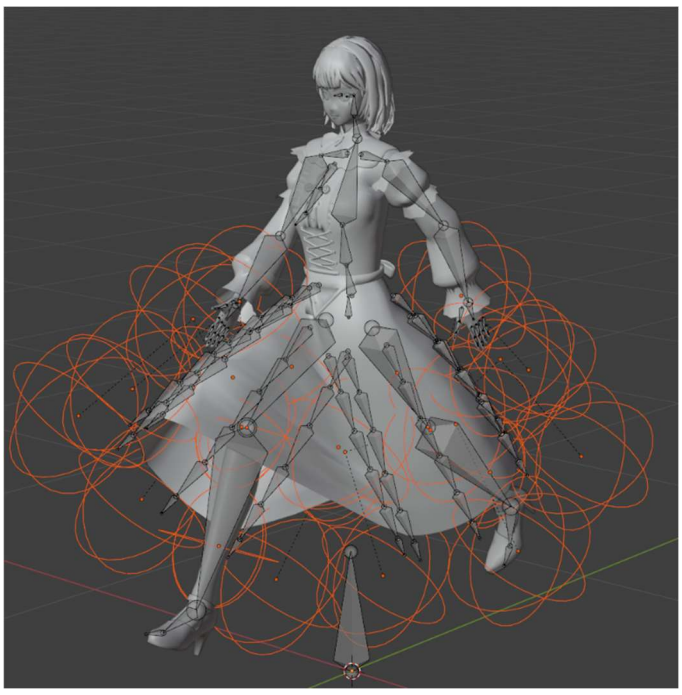
The survey was conducted in 2023, and the situation has not changed significantly since then. The most frequently reported challenges were spring bones, followed by materials (MToon 10).

Many of these challenges could likely be avoided with more comprehensive documentation. Currently, the VRM specification is not consolidated into a single document, and descriptions are highly simplified, making it very difficult to determine whether an avatar's behavior conforms to the specification.

In particular, matters described in the base glTF 2.0 specification, or implied from it, cannot be fully understood from the VRM documentation alone. For example, in VRM skinning, the rule that a single vertex can have weights for up to four bones is only found in the glTF 2.0 specification.

Furthermore, features unique to VRM 1.0 are part of an extended specification, so they are not included in glTF 2.0, and the VRM documentation is often unclear. Detailed explanations, along with numerous practical examples, should be provided as part of the documentation.

From my experience using VRM 1.0 features, the inside collider is effective for preventing skirt-leg intersections, as I explained in a previous article. This is another case where clear documentation is required so that third parties can understand and reproduce the results accurately.



The skirt's spring chains are controlled by normal colliders on the inside and inside colliders on the outside, thereby suppressing leg penetration into the skirt.

Regarding the expression capabilities of VRM 1.0’s spring bones, I have confirmed that, for example, long sleeves on traditional Japanese clothing (kimono or furisode) can move very naturally using constraints.

A parent bone with an Aim constraint is placed at the root of the sleeve’s spring chain, its reference bone is set to a bone parented to the Hips at the feet, and the spring chain is oriented downward.

Even in this example, documentation should include explanations of VRM node constraints, so that third parties can understand the mechanism and reproduce it. I plan to cover the creation of kimono-style avatars using VRM constraints in a separate article.

4. Conclusion

The official version, VRM 1.0, has low visibility of its advantages and limited backward compatibility. As a result, avatars sometimes behave correctly according to the specification but are perceived as having bugs, which can give a negative impression. These issues show the need for the VRM Consortium to continuously gather information and provide timely guidance and recommended solutions.

On the user side, it is important to actively send questions and requests to developers, such as the UniVRM team. Even if you don't fully understand the specifications or can't read program code, don't hesitate to share your feedback. Interestingly, a significant portion of developer feedback comes from overseas. While the number of VRM users abroad may be small, interest among international creators appears higher than in Japan. For this reason, I plan to share my articles in English so that readers outside Japan can also access them.