Automatic Remastering Of Classic Franchise Video Games

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The 21st century has seen many great video games born. Although some of them are standalone works published by boutique studios, such as Braid, most of the masterpieces are parts of their corresponding franchise series from established game companies, such as Halo, Call Of Duty, and Hitman, etc. As many gamers noted, however, making an excellent sequel often seems even harder than creating an exceptional initiation. Multiple series have introduced games with groundbreaking graphics yet mediocre storylines or play styles, so disappointed players would rather go back to previous installments which lured them into the franchise and brought them immense joy. However, only then would they realize that their previously experienced graphics already seem unacceptable by current standards, and they end up in a dilemma between good graphics and good content.

From time to time, video game companies does release a remastered / remade / rebooted version of their previous works to bring back players into the franchise, such as Halo: The Master Chief Collections (MCC). But such work is not always cost-benefit efficient from the perspective of the game companies, so they make fewer of these than new games or simply charge the same price as a new game. One good example is the recent uproar among gamers caused by Naughty Dog charging a full price of $70 for a remake of The Last Of Us Part I. Therefore, it would be great if there is a procedure to automatically enhance the graphics of previous installments to current-generation levels. Such a procedure would be highly useful for both the game companies which can cheaply publish remastered versions and the gamers who can create graphics mods on their own.

In this project, I will work on prototyping parts of such a procedure. This project is inspired by "Enhancing Photorealism Enhancement" by Intel Labs where the researchers used deep learning techniques to make GTA V look even more photorealistic. The researchers achieved this by training their neural networks on real, annotated cityscape data like KITTI, CityScapes, and Mapillary Vistas. The neural networks consist of a G-buffer encoder, an image enhancement network, and a perceptual discriminator. Note that one can actually extract semantic segmentations from the the G-buffer encoder. Therefore, my workflow would be the following, using Halo as an example:

1. Treat the remastered Anniversary version of Halo 2 as the "reality" dataset and use the G-buffer encoder or other open source / commercial solutions to annotate it
2. In comparison to the problems faced by the Intel Lab researchers, I have the advantage of the fact that the original Halo 2 and the remastered Halo 2 have exactly the same content and only different graphics rendering. Therefore, I do not need video annotations that are too accurate, since the content are already lined up. With that

being said, I am also looking for other papers and methodologies that can actually leverage this advantage of content mapping.

3. I will use the paper's methodology to remaster the original Halo 2, and compare the results with the actual remastered Halo 2. Of course, the expectation is to have reasonable improvements rather than beat the actual remastered version.
4. More interestingly, I can then try to remaster Halo 1 using the networks trained on Halo 2 comparisons, and compare the results with the actual remastered Halo 1.

Since my time and budget are limited and I do not have a teammate, I may not complete all steps above or have impressive results, but I will try my best to accomplish at least something that shows visually interesting work. As I continually search for better references and methodologies, I may also have revisions on my final project that are different from this proposal.