# Computer generated car design

## Steps to deeming the system creative by Lennert Bontinck

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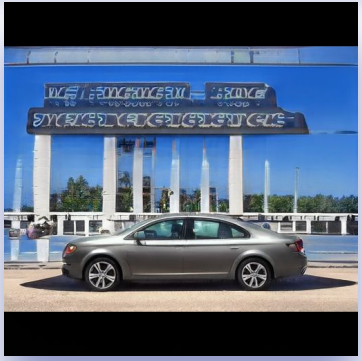
# Remember my project?

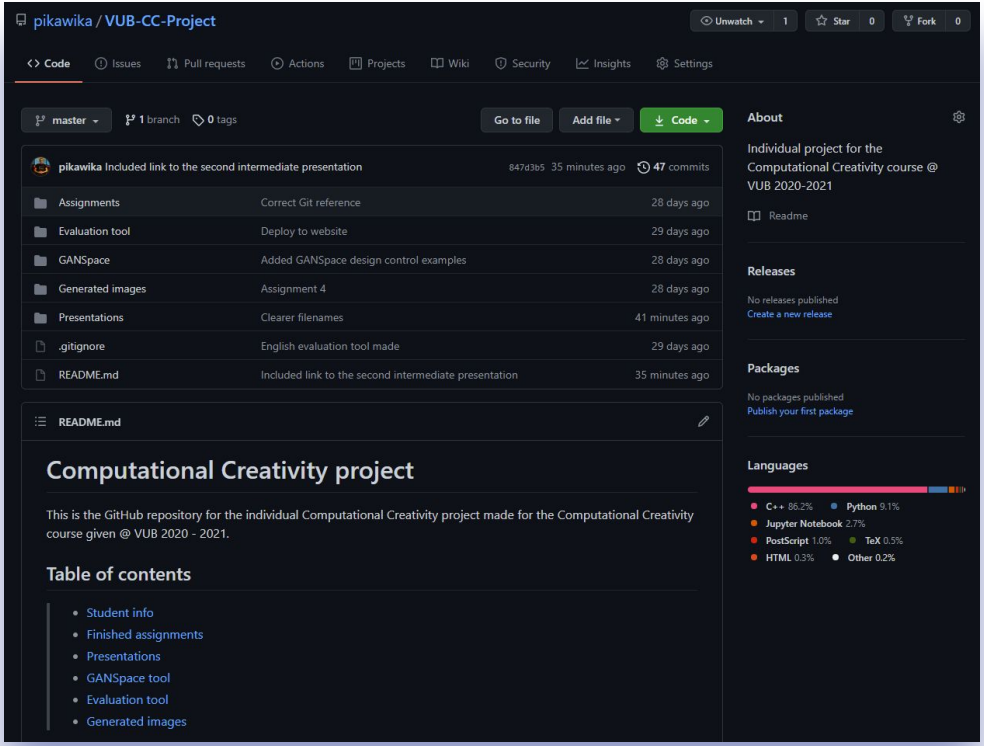
- Pre-trained StyleGAN2 model
  - Create images of cars
- Extended GANSpace tool
  - Have control over the GAN
  - Modify tool for project
- Generative vs creative
  - Situate system in a creative framework
  - Exhaustive discussion on the internal and external evaluation

Bontinck, L. (2021). *Computational creativity project* [GitHub commit: 847d3b5...]. Retrieved May 3th, 2021, from https://github.com/pikawika/VUB-CC-Project

# Status update

- Pre-trained StyleGAN2 model ✔️
- Extended GANSpace tool ✔️
- Generative vs creative 🔨
  - Situate system in a creative framework 🤔
  - Exhaustive discussion on the internal and external evaluation 🕒

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# Choosing the “right” framework

- Not as easy as it seems
- How to build a CS (Ventura, 2017)
  - Generalise CS components to more easily represent CC system
- The CSF (Wiggins, 2006)
  - Formalise concepts of Boden’s (2003) philosophical theory of creativity
  - Focus on what programs do
- ...


Boden, M. A. (2003). *Creative mind: Myths and mechanisms(2nd ed.)*. Routledge.
Ventura, D. (2017). *How to build a cc system. ICCC.*
Wiggins, G. A. (2006). A preliminary framework for description, analysis and comparison of creative systems. *Know.-Based Syst., 19(7)*, 449–458. https://doi.org/10.1016/j.knosys.2006.04.009

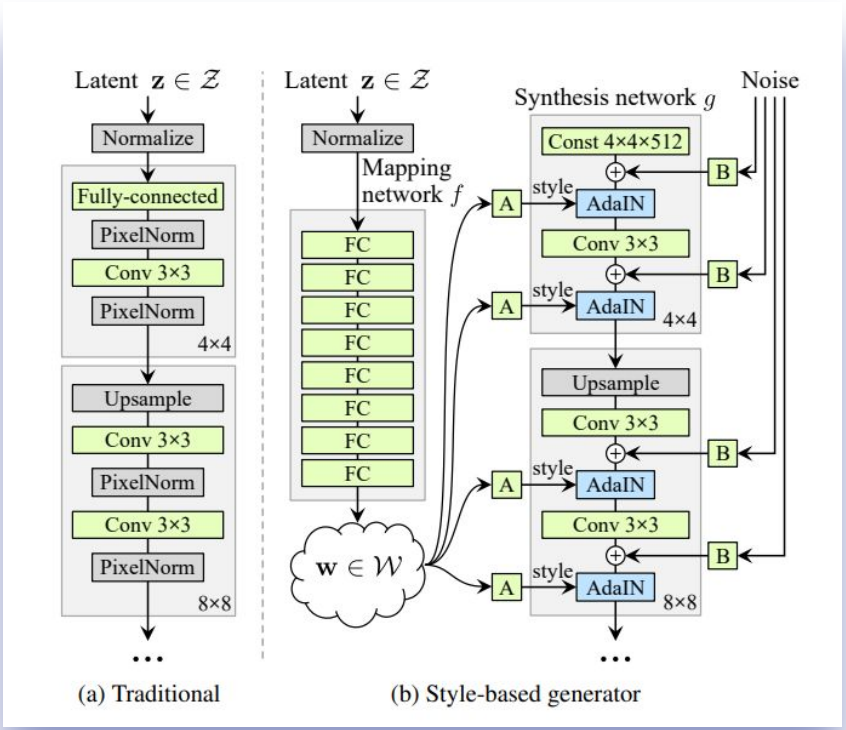
# About Boden's philosophical points

- P(ersonal) vs H(istorical) creativity
  - Historical can't be enforced
  - Non-historical might even be more interesting
- Exploratory vs transformational
  - The generator transforms based on discriminator
  - Latent space exploration


Boden, M. A. (2003). *Creative mind: Myths and mechanisms(2nd ed.)*. Routledge.

# Description in the CSF (1)

- The universe (U)
  - Technically: all RGB combination of pixels
  - Generator: all images deemed “real” by the discriminator
  - Thus: images containing cars
- Conceptual space (C)
  - The set of all images the generator can make based on different seeds (noise input) with its latest transformers
- Clearly, U ⊂ C

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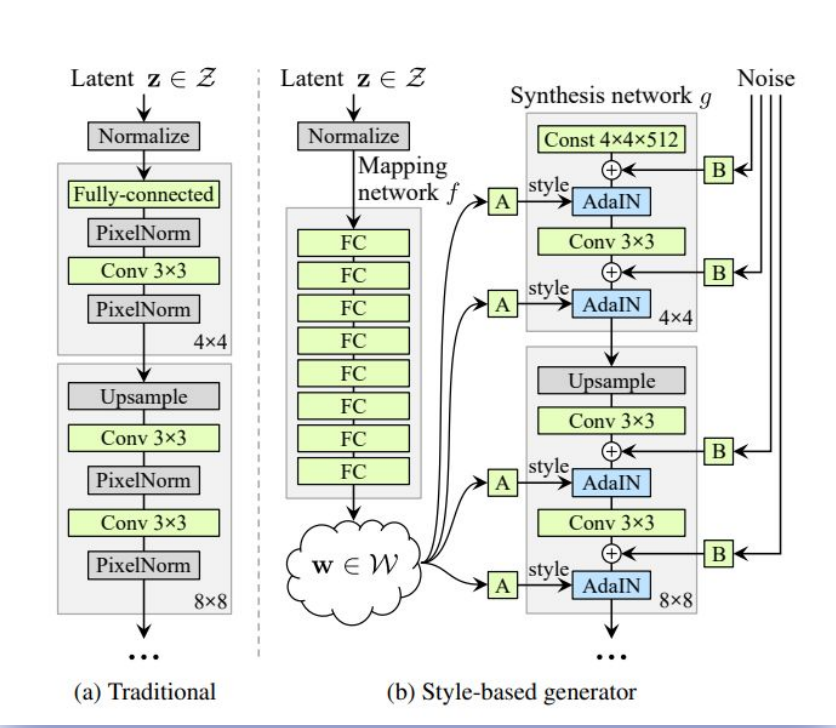
# Description in the CSF (2)

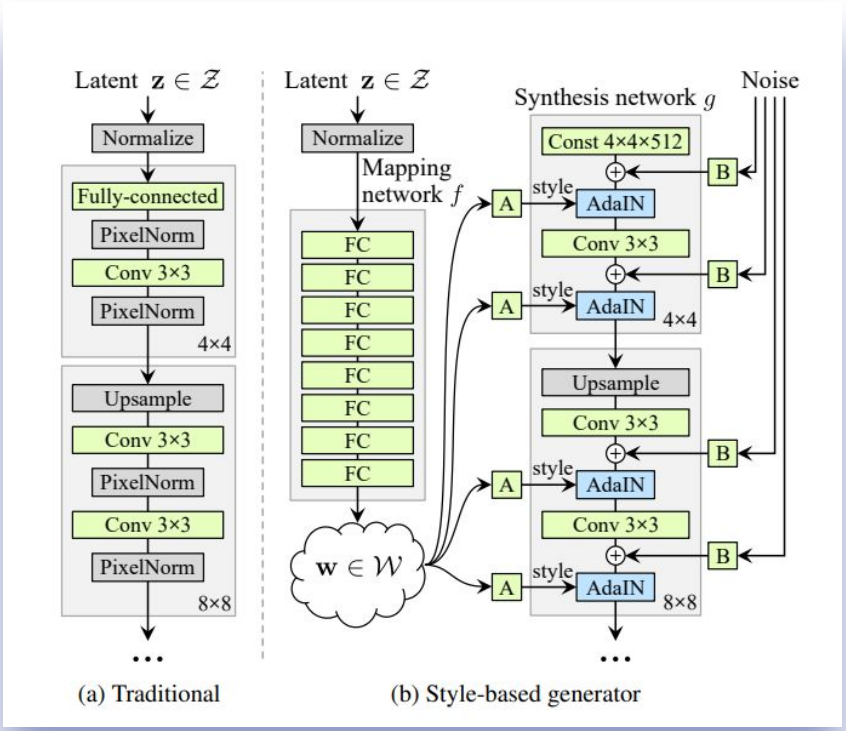
- Remember C = [[R]](U)
  - Thus R, the rules constraining the space, are the same rules defining the *state* of the generator
- The rules T
  - Rules that introduce randomness and noise as restrictions on latent spaces
  - GANSpace uses these to “explore the conceptual space”




Boden, M. A. (2003). *Creative mind: Myths and mechanisms(2nd ed.)*. Routledge.

# Description in the CSF (3)

- The rules E
  - The rules that define the discriminator can be used to assess the quality of the generator image
  - A similarity  checking system can test for P-creativity

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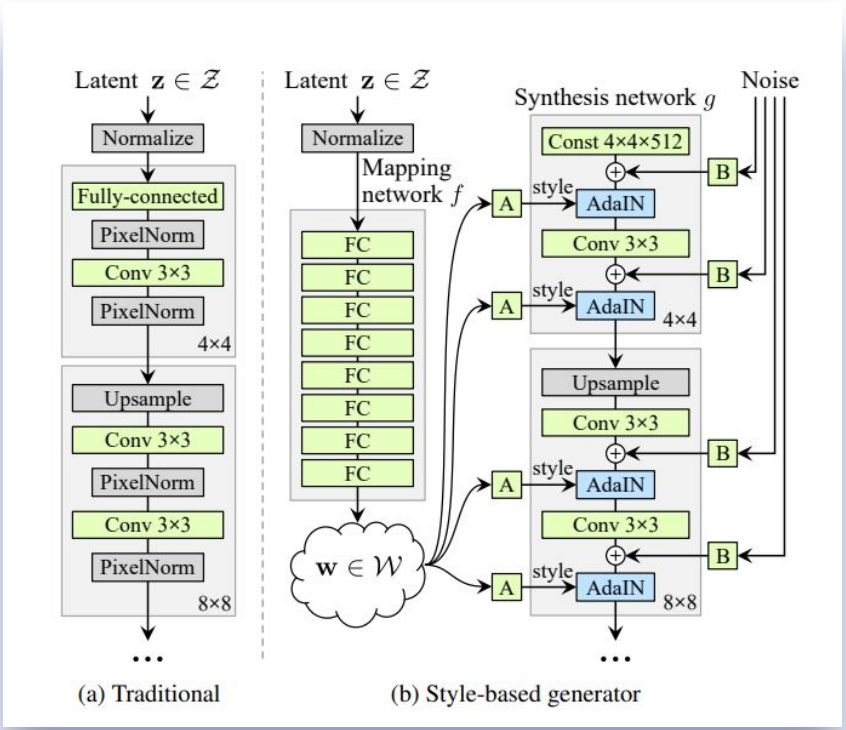
# Description in the CSF (4)

- Is the output of $F^{\diamondsuit}$ infinite?
  - Limited by output of 512x512 images
  - Limited by StyleGAN2 seed limit
  - Limited by GANSpace 512 dimensioned vector for latent space exploration
- Thus: $e_c$ = <R, T, E>$^{\diamondsuit}$({T}) is also finite
- Note: GANSpace could possibly bypass some of StyleGAN2's rules, making $e_c \not\subset C$

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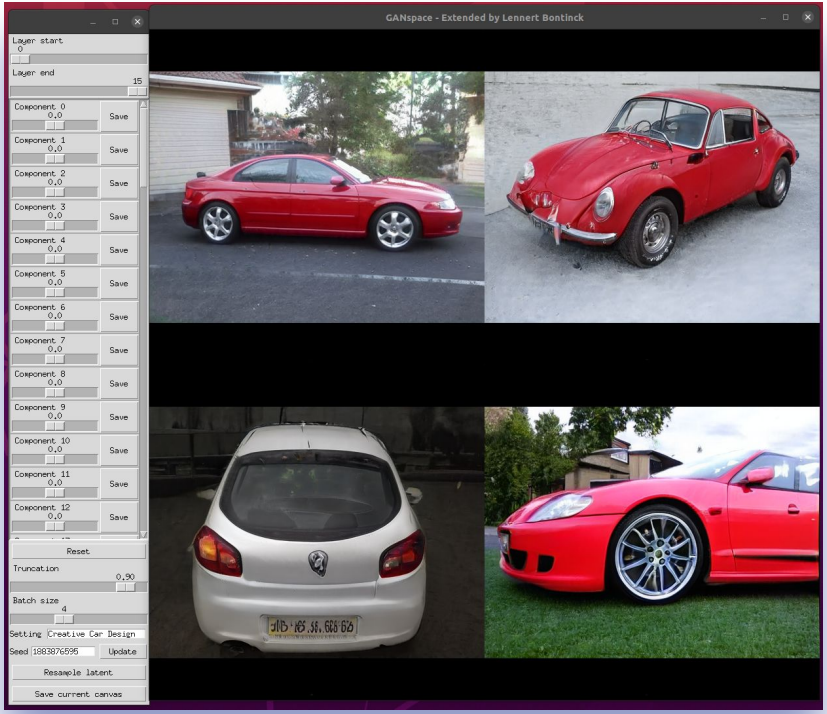
# Defending transformational creativity

- Remember R: the rules constraining the space, are the same rules defining the *state* of the generator
  - StyleGAN changes the rules of the generator based on exploration that yields more output accepted by E, thus while training, R is changed
- GANSpace can (manually) explore T, modification might allow it to transform T, latent space restrictions in particular

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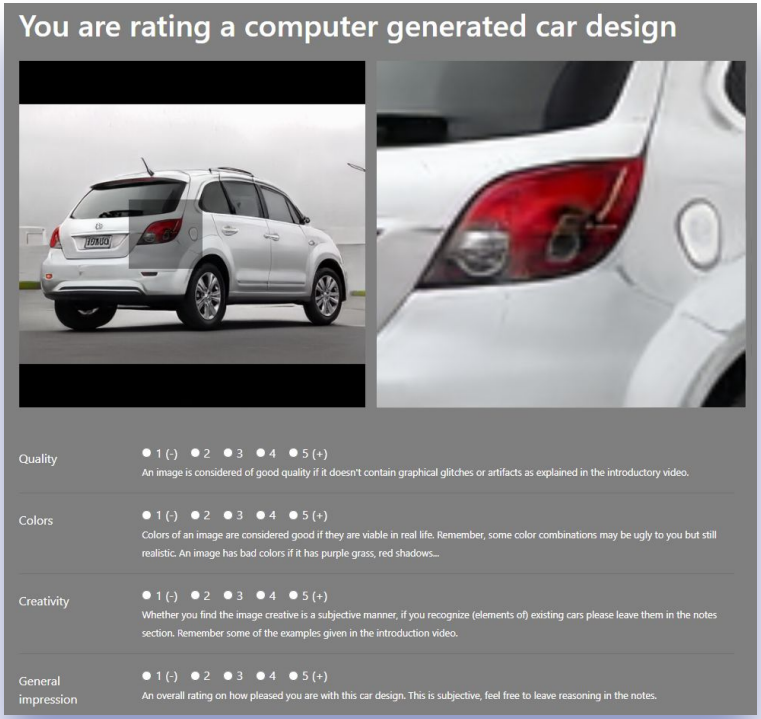
# What's next?

- Describe the system using "How to build a CS" (Ventura, 2017)
- "The study and support, through computational means and methods, of behaviour exhibited by natural and artificial systems, which would be deemed creative if exhibited by humans." (Wiggins, 2006)
    - external validation!

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# Questions about Computer generated car design?

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