The Illusion of Life

Laurent Pujo-Menjouet [1,2], and Andreas Wessel-Therhorn[3]

[1]Univ. Lyon, Universit Claude Bernard Lyon 1, CNRS UMR 5208, Institut Camille Jordan,
[2] INRIA Grenoble Rône-Alpes, DRACULA Project-Team, F-69622 Villeurbanne Cedex, France,
[3] Animator and film director, 5016 Bakman Ave. 205, North Hollywood, CA, 91601, USA,
pujo@math.univ-lyon1.fr, awessel-therhorn@sbcglobal.net

Abstract

One of the main goals of robot designers or computer scientists working on artificial intelligence is to give the illusion of life in their creations. For this Graal quest, our first thought would be to look around, study and copy the existing living beings in nature like humans or animals. This has been applied for centuries to solve technical issues like bird wings for planes or four leg walks for robots. But neither biomimicry nor the search for a perfect and accurate replication of reality lead to the illusion of life. Our belief is the following: it seems necessary to go beyond the technical nature of the living creature we want to copy. How and where to find a solution to this problem? Who tried to solve this in first place? In which context? And more importantly, can we adapt these methods in computer or robotics research? The answers given here can be found in the film industry and more particularly in the world of one of the pioneer studios in animation, the Walt Disney studios and its golden age: the late 1930s.

Eighty years ago: the Nine Old Men

Let us then go back more than 80 years ago. In the early 1930s, right after the Great Depression of 1929, many artists could not find any satisfactory jobs with a living wage. Many talented artists found work at the rapidly expanding Walt Disney Studios. They were not only excellent draughtsmen but also literally animators in the sense that they would be able for the first time to give a real soul (*anima*) to their drawings. Nine of these animators left their marks in the history of the studio. Walt Disney named them the *Nine Old Men* in reference to the nine members of the Supreme Court, so called by Roosevelt in the late 1930s. They soon became the soul of Disneys cartoons for the following 50 years (see Fig. 1). How did they manage to achieve the illusion of life? What techniques emerged from their collaboration throughout these years?

In the 1920s and early 1930s, animation artists used to attract the audience with slapstick comedy in short movies. Characters were moving in simple actions, drawings were basic (with rubber hose animation), they were entertaining but the audience was not really empathizing with them. It was working up to a certain level. But that was not really satisfactory for Walt Disneys ambitious projects. Dis-

Figure 1: Artist view of an animator working on his light board (original drawing from Andreas Wessel-Therhorn).

ney wanted to move people, wanted them to be attached to the point they could have empathy and even cry. This was a great challenge and it had never been done before (Canemaker, 2001), (Deja, 2015).

He decided to re train his artists from the ground up, building new foundations for this young branch of the Seventh Art. They discovered new techniques from their experience, their hesitations, their attempts, their failures and their successes. They eventually developed the 12 principles of animation, a strong base applicable to all kinds of animation. These principles are so functional and efficient that they are still used by every animators to this day.

The 12 principles of animation

These principles were applied for the first time in the early 1930s in films like *The Three little pigs*. They were improved and refined in the first masterpiece, *"Snow White and the Seven Dwarfs"* in 1937 (Disney, 1937) and the other animated features that followed. These principles, developed over the first half of the last century, are still the basis for all
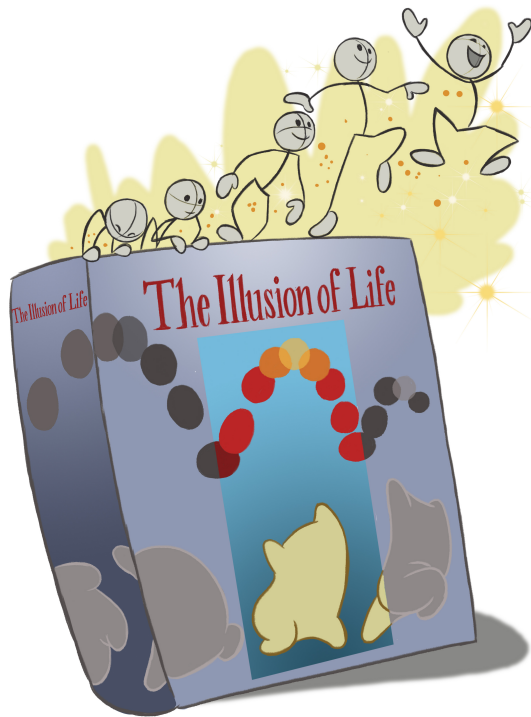
Figure 2: Animator's view of the spirit of the "*Disney Animation, the illusion of life* book" (Thomas and Johnston, 1991) (original drawing from Andreas Wessel-Therhorn).

character animation today.

What are these 12 principles of animation? How do we apply them? What does happen if some of them are missing? And more importantly: can we build robots able to simulate the illusion of life in such a way that we could feel sympathetic to them? In 1981, two of the Nine Old men, Ollie Johnston and Frank Thomas published a book, entitled *Disney Animation: the illusion of Life* (Thomas and Johnston, 1991). It became the "bible" for all artists studying animation and was voted the best animation book of all time (see Fig. 2 for an artist's view of the spirit of this book). Here, the 12 principles of animation were first stated:

1	:	Squash and Stretch
2	:	Anticipation
3	:	Staging
4	:	Straight ahead action and pose to pose
5	:	Follow through and overlapping action
6	:	Arcs
7	:	Slow in and slow out
8	:	Secondary Action
9	:	Timing
10	:	Exaggeration
11	:	Solid Drawing
12	:	Appeal

In our presentation, we briefly address all of these, spend-

ing more time on the most relevant ones as they relate to robotics. We show how easy it is to fall into traps, leading to animation failures. We illustrate them with classic animated examples as well as with live demonstrations given by Andreas Wessel-Therhorn, a former Disney animator, now working freelance. After demonstrating some tricks of the trade, our audience will start looking at animation in a new way and hopefully create robots, virtual or artificial beings that not only move, but move us in an illusion of life. This new era has already started in a discrete way with Lasseter (Lasseter, 1987), now the head of the *Walt Disney Animation*. It is now seriously considered in fundamental research as mentioned in (Bates, 1994), (van Breemen, 2004), (Ribeiro and Paiva, 2012), (Zawieska, 2014), and (Punsvik, 2014), and soon get real with the release of *Jibo*, who is about to "*change our definition of robot*" [1].

References

Bates, J. (1994). The role of emotion in believable agents. *Communications of the ACM*, 37:122–125.

Canemaker, J. (2001). *Walt Disney's Nine Old Men and the Art of Animation*. Disney Editions.

Deja, A. (2015). *The Nine Old Men: Lessons, Techniques, and Inspiration from Disney's Great Animators*. Focal Press.

Disney, W. (1937). *Snow White and the Seven Dwarfs*. Walt Disney production.

Lasseter, J. (1987). Principles of traditional animation applied to 3d computer animation. In *SIGGRAPH 87 Proceedings of the 14th annual conference on Computer graphics and interactive techniques*, pages 35–45. IEEE.

Punsvik, S. (2014). Making meaningful causalities that are clear, believable, and engaging. In *TPD4195 - Design Studies lectures*.

Ribeiro, T. and Paiva, A. (2012). The illusion of robotic life, principles and practices of animation for robots. In *Human-Robot Interaction (HRI), 2012 7th ACMIEEE International Conference on*. IEEE.

Thomas, F. and Johnston, O. (1991). *Disney Animation: The Illusion of Life*. Abbeville Press.

van Breemen, A. (2004). Bringing robots to life: Applying principles of animation to robots. In *CHI Workshop, Shaping Human-Robot Interaction Understanding the Social Aspects of Intelligent Robotic Products*.

Zawieska, K. (2014). Social robots: Fostering creativity through the illusion of life. In *Workshop on Humanoid Robots and Creativity at the IEEE-RAS International Conference on Humanoid Robots (HUMANOIDS2014)*. IEEE.

---

[1]www.jibo.com