

Latex versus Pixels: Practical Prosthetics and Digital De-Aging in Modern Film

Sheryl Rachel Baijoo, Priyanka Dewatwal

Amity School of Film and Drama , Amity University Uttar Pradesh , Noida, 201303, India

Amity School of Film and Drama , Amity University Uttar Pradesh , Noida, 201303, India

Abstract - The modification of the human face and body has long been a fundamental element of cinematic storytelling, enabling filmmakers to create more believable and engaging characters. This paper explores two contemporary techniques used for such transformations: practical prosthetics and digital de-aging. Prosthetics involve the use of physical materials applied directly to actors, allowing natural interaction with lighting and performance, while digital de-aging relies on visual effects in post-production to alter appearance with greater precision. By examining factors such as realism, performance, cost, and audience perception, the study highlights that neither method fully replaces the other, and modern filmmaking often combines both to achieve more effective results. This integration allows for a balance between authenticity and creative flexibility, making hybrid approaches increasingly common in contemporary cinema.

Key Words: Practical Prosthetics, Digital De-Aging, Visual Effects (VFX), Computer Generated Imagery (CGI), Cinematic Realism, Hybrid Filmmaking Techniques.

1. INTRODUCTION

Transformation is always has been an important aspect of making film interesting. Throughout the film history the filmmakers have tried a lot of techniques to transform the physical state of a person in the film. These transformations have been used in the context of indicating the processes of aging, as a biography of a real person, where the character is not real, and to demonstrate the physical change so that the audience relate to the film. Sometimes physical transformation is much more than a simple special effect. It plays an important role in storytelling, identity creation and character development.

In the early days of film production, specialists in the art of makeup would make use of enhanced practical effects to alter the physical appearance of the actor. These included the use of grease paint, wigs, padding and hand-made facial appliances. These original methods of makeup were relatively basic in the early days of film production but were vital in turning this art into what it is today. The art of prosthetic makeup has evolved over the years into a unique art which incorporates elements of sculpture, anatomy and chemistry.

Over the course of film history, however, makeup artists have become more creative and began to use materials such as latex and silicone to do their special effects work. In doing so, the effects artist was able to produce effects that realistically mimicked the natural movement and appearance of skin. When

applied, the effects could change the shape of the face or make the physical appearance of the actor alter enough so as to give the appearance of the character having changed or living within a different time period. As film theorist André Bazin states, however, “the significant quality of cinema is that it rests on the recording of physical reality through the use of the camera. For the first time, the physical representation of the world has established a direct connection with the image” (Bazin, 1967).

Another thing that prosthetic makeup may affect on the actors is how they carry themselves through the performance. As the prosthetic makeup could make the actors has to move differently and talk differently and maybe even perform differently. This could help the actors a bit to get in to character, which shows that prosthetic makeup could change not only the physical appearance of the actors but it could also change the physical working process of the actors.

The realm of cinematic transformation has experienced a massive transformation in the recent past owing to the new digital technology. This is because computer-generated imagery and digital effects have become an essential feature in film production. This new phenomenon has affected the realm of cinematic transformation in numerous ways. For example, digital de-aging used in the production of films is an essential aspect of the realm of cinematic transformation. Digital de-aging is a technology used in film production whereby the facial features of actors are altered to look younger.

Digital de-aging requires the use of special software and special equipment to capture the movement of the screen actors’ facial features. This technology alters the actors faces and wrinkles to make them look younger. This is different from prosthetic makeup in that the actors do not require to wear heavy makeup during the production of the film.

There are many recent films that have used this technology so that are characters can be shown in different times in their lives. A good example of this is The Irishman, the film has very renowned actor like Robert De Niro and Al Pacino playing characters from different eras of their life. Instead of having several actors playing one of the characters in different eras of their lives, the actors were transformed into look closer to the characters of the different eras. Yet simultaneously the development of digital methods raised doubt about the realism and authenticity of films.

However some opinions state that digital may appear slightly artificial if it is not the exact replica of natural faces movement and some think that these problems are being overcome with the development of new technology. As film

scholar Stephen Prince describes, 'realism is not defined by physical reality but by the believability of the image'. So 'if the image looks real, then it will be believed to be real'. Despite the development in digital methods practical prosthetics are still widely used in 'the modern blockbuster cinema'.

Indeed many directors have enjoyed the tangible quality of false makeup effects and prosthetics. Prosthetics allow actors to interact directly with the physical properties of what covers and shapes their characters, and this physical interaction may bring about more character presence. Furthermore, many filmmakers are combining prosthetics with digital effects to achieve the best results. And this simple fact again proves that film transformation is not a transition from old to new; it is an integration of old and new together. And this is why the knowledge of both these processes would help us understand the filmmaking process. This dissertation concentrates the relationship between prosthetic makeup effects and digital de-aging through studying a few individual movies and for this reason, will investigate whether prosthetic makeup effects and digital de-aging techniques compete with each other or cooperate together.

2.REVIEW OF LITERATURE

For years, realism has been a central concern in film theory. Scholars have explored how viewers perceive animated imagery to be 'real,' in spite of sophisticated cinematic techniques used in its creation. While discussing techniques for altering an actor's look on screen, this becomes a highly relevant point. Digital de-aging and physical prosthetics are both designed to be invisible, but their processes could scarcely be more different, and to have a full understanding of how these strategies might operate in contemporary film making, an understanding of the theoretical debates over notions of realism, digital image, artifice and audience perception is helpful.

One of the most influential theories of cinematic realism was developed by film theorist André Bazin. Writing in the mid twentieth century, Bazin argued that cinema has a uniquely direct connection with the world because, as with photography, the camera is physically in the place of what it is shooting. This is termed an "indexical" connection, as a real object or event occurring during filming is instantly connected with the shot (Bazin, 1967, p. 14). Cinema employs the tools of photography to mechanically reproduce the world, unlike painting or drawing which are entirely human constructs.

Alas this usual explanation of the cinematic reality has become somewhat of a gray area with the progress of digital filming. Today a lot of cinema's image creation is no longer confined to recording real incidences because of the application of CGIs on film. Today digital cinema often entails the combination of digitally generated sections with live digital films. As defined by the media theorist Lev Manovich, digital cinema is any departure from a purely photographic image in favor of an image 'created on/with/by a computer' (Manovich,

2001, p. 295). It is when the result is different from what was originally created as the captured image for filming because digital workflows are built to subtly or explicitly incorporate and modify images using computer software.

The change has been exemplified by digital de-aging which involves shooting the characters playing the scene as they normally would, then digitally transforming their features into a younger version in post production. The shot of the actor on set is dissected by vfx artists, who transformed the age by adjusting wrinkles, skin color, tissue density and bone structure. The final image is partly digital, but the performance is authentic. This change has profound implications for the way viewers interpret photographic images. Even if an image is no longer a true visual record of an existing object, is it possible for it to be considered realistic? It is the concern over issues such as this, which film historian Stephen Prince addresses, by using the term of perceptual realism. Prince argues that rather than judging the pictures of realism on the basis of their physical authenticity, viewers judge objects of realism according to the visual behaviors of the object in question, and whether they match the visual behaviors of things viewers believe should exist in the real world (Prince, 1996, p. 34). If an object's visual behavior is consistent with viewers' expectations of the visual behavior of real objects then it will be considered credible.

Even more problems arise when trying to alter a human face digitally. Facial movements and expressions are an area where humans are very sensitive to even tiny nuances. Even slight inconsistencies can be seen. Masahiro Mori, a Japanese roboticist, brought up what he called the "uncanny valley" to try to explain this phenomenon. The idea is that the level of comfort felt towards a puppet or robot, for example, increases as it becomes more realistic... up to a point. For example, people sometimes report feeling uncomfortable or disturbed when a picture appears almost but not quite human (Mori 1970 p. 33).

The uncanniness of the valley concept is very often invoked to explain how audiences respond to computer animation and visual effects in movies. It can be very relevant when trying to mimic "younger" skin and facial shape during digital de-aging. An audience can find a digital actor face too "plastic" looking and if the physical movements of the skin do not relate to the actor's face and expression as expected.

It is true that more practical prostheses often avoid this issue by employing real materials that naturally interact with the environment. Natural lighting on a silicone or latex prosthesis produces highlights and shadows similar to that on real flesh and internal facial musculature (the actors own muscles beneath the prosthetic) is responsible for the motion.

Another useful theoretical perspective is embodied cognition. Cinema scholar Vivian Sobchack describes watching films as a sensory experience and a bodily awareness, apart from ocular perception (Sobchack, 1992, p. 65). She says that viewers automatically link physical movements on the screen and their own physical sensations.

This analysis is very relevant when considering how prosthetic makeup affects the actor’s performance. Because prosthetics physically alter the actor’s face or body, the actor’s posture, gestures, and movements may be altered. The weight or lack of flexibility of the prosthetic component can lead to variations in their emotion and acting in the scene.

Secondly, in another sense the actor’s physical experience during the shoot is less affected by digital de-aging as no physical limitations of prosthetic appliances are experienced. This allows greater freedom of body movement, but the transition is still among the visual and not corporeal level.

Nonetheless, the digital de-aging may have positive impacts for filmmakers. One of the best benefits of using the digital de-aging is its cinematic flexibility. In feature films, the same characters would often have scenes showing them at different ages. This could have required multiple different actors in the past. Now with digital de-aging, one actor can play the same character over countless decades, while maintaining realistic voice change, face identity and appropriate expression style.

Movies such as *The Irishman* demonstrate how this technology may allow for complex stories to be told that take place over large periods of time. We saw that by digitally aging actors like Al Pacino and Robert De Niro filmmakers were able to depict their characters at varying stages of their lives without the need for additional actors.

But some audience and critics have challenged the usage of digital de-aging. Critics also feel that if a technique goes straight from a digitally young face to an aging body the movement of the body might not reflect the actor’s real age, as the aging performance will be too much to be shown through uncaging frame, and proved by actor’s aging physicality such as postures, gestures, and movements.

They’re symptoms of wider changes in film making. Before, makeup artists were mainly responsible for changing a character’s look on stage, but as digital visual effects become more mainstream, with VFX artists sharing the ownership of a character’s look as much as the actors.

More often, digital effects are used in hand with prosthetic makeup rather than substituting it. In most current productions, aspects such as skin texture, seams or small facial movements are enhanced by the usage of digital elements added to the prosthetic. It allows filmmaker to utilize the benefits of digital technology with the realistic feeling of the physical.

3.COMPARATIVE ANALYSIS: PRACTICAL PROSTHETICS AND DIGITAL DE-AGING CONTEMPORARY CINEMA

Today, changing the human face and body has become a mainstay in filmmaking as a means of visual storytelling. In the modern cinema filmmaker’s two main approaches for altering the human face and body are through digital de-aging and

practical prosthetic makeup. While both techniques aim to alter the actor’s appearance they do so in two very different ways and result in two very different aesthetic and affective outputs. Practical prosthetics employ the use of physical materials that can be placed directly onto the face or body of the actor (such as silicone, latex and prosthetic appliances). Digital de-aging takes place by altering the actor’s face post-filming through computer generated imagery and visual effects software.

The above techniques are two of the most prevalent in current Hollywood filmmaking. Films such as *The Whale* and *Darkest Hour* reveal the level of efficacy of authentic prosthetic effects, while films like *The Irishman* and *Indiana Jones* and the *Dial of Destiny* make full use of digital de-aging. How each style enhances the art of moving image narrative can be explored through comparison on a number of elements, such as realism, actor performance, production procedures, viewer appraisal and technological limitations.

Table 1. Fundamental Differences Between the Two Techniques

Aspect	Practical Prosthetics	Digital De-Aging
Definition	A physical transformation technique where makeup artists apply prosthetic materials to alter an actor’s appearance	A digital visual effects technique used to make actors appear younger through CGI
Materials/ Technology	Silicone, latex, foam prosthetics, sculpted facial appliances	Motion capture, facial tracking, CGI rendering, AI-based facial reconstruction
Stage of Production	Applied before filming and present during production	Applied after filming during post-production
Interaction with Actor	Actor performs while wearing the prosthetics	Actor performs normally; transformation happens digitally later
Examples in Film	<i>The Whale, Darkest Hour</i>	<i>The Irishman, Captain Marvel, Indiana Jones and the Dial of Destiny</i>



Figure 1. Pre and Post—Brendan Fraser, *The Whale* (body prosthetic transformation)



Figure 2. Before and after—Gary Oldman as Winston Churchill in *Darkest Hour* (prosthetic makeup)

These images simply illustrate how prostheses alter the physical makeup of the actor's face and body



Figure 3. Before and After Samuel Leroy Jackson in *Captain Marvel* (Digital De-aging)



Figure 3. Pre and Post – Harrison Ford in *Indiana Jones and The Dial of Destiny* (Digital De-aging)

These visuals demonstrate the alterations digital de-aging makes to an actor's face, which involves the use of visual effects to diminish aging signs, refine skin surface and project a young actor from the past on the silver screen Realism and Visual Plausibility

4. REALISM AND AUTHENTICITY

Realism is perhaps the most important aspect of cinematic change. In fact, even small anomalies may have been disruptive enough to affect the viewers' image of reality in the human face. Practical prosthetics are often praised for their realistic qualities because they are physically fixed on the actor's face and interact with the camera and light in a natural manner. Shadows, skin textures and facial contours seem more true to life because they are filmed, not computer generated.

Makeup artist Kazuhiro Tsuji designed some of the largest and most involved prosthetic appliances necessary for his transformation as Gary Oldman into Winston Churchill for *Darkest Hour*. It allowed Oldman to act and speak as the historical figure would have, altering his posture and jawline in addition to the shape of his face. Similarly, *The Whale's* Brendan Fraser required the use of technically advanced prosthetic appliances to completely transform his body into an extremely obese one. These appliances, placed directly on the actor, integrated perfectly with the lighting and filming.

However, these are achieved digitally using digital modeling and animation to attempt what is 'realistic'. In order to make the actor look younger, the special effects artists carefully edit the actor's wrinkles, face shapes and skin quality. An example is Robert De Niro who was digitally de-aged to play his character over many years in *The Irishman*. There was reported to be a slight dissonance between the motions of the body and the synthetic youthful face, although technology allowed the same actor to show different age phases.

Table 2. Key Differences Between Practical Prosthetics and Digital De-Aging

Realism Factors	Practical Prosthetics	Digital De-Aging
Skin texture	Naturally captured by camera	Digitally simulated
Lighting interaction	Completely natural	Requires digital rendering
Facial movement	Slightly restricted by appliances	Fully flexible
Risk of artificial appearance	Very low	Moderate if VFX not perfect

Figure 4. Gary Oldman – Before and After Prosthetic



Makeup (Darkest Hour)



Figure 5. Robert De Niro – Before and After Digital De-Aging (The Irishman)

This images enable readers to visually compare/see physical realism vs digital realism.

5.IMPACT ON ACTOR PERFORMANCE

Another significant difference is what prosthetics can do for actor performance. Acting is not purely vocal performance; facial expression, body language, and aura are all important. Prosthetics incorporate the actor’s change into their physical

being; many actors felt that seeing themselves, altered in a mirror, helped them psychologically assume their roles.

Prosthetics, of course, also require a great deal of preparation work. Before actually making the prosthetic, the actor can spend dozens of hours in the makeup chair. During long shoots, large prosthetics can sometimes inhibit the actor’s ability to move their face and can be physically uncomfortable.

Because the performers are not constricted by prosthetics, digital de-aging works differently. They are free to express their feeling without any physical restrictions as their face is still fully free to move naturally. The transition is done by visual effects.

Table 3. Performance Comparison of Practical Prosthetics and Digital De-Aging

Performance Factors	Practical Prosthetics	Digital De-Aging
Preparation time	3–6 hours of makeup application	Minimal preparation
Facial flexibility	Sometimes limited	Fully natural
Actor immersion	Strong psychological transformation	Less immediate transformation
Physical comfort	Can be uncomfortable during long shoots	More comfortable for actors



Figure 6. Special effects prosthetic makeup (The Whale)



Figure 7. The motion capture setup employed for digital de-aging

6.PRODUCTION WORKFLOW AND COST

The digital effects and prosthetics are created in very different ways. The prosthetic transformations are prepared before filming begins and are used every day of filming. Consequently, there is less requirement for subsequent visual effects alterations as the transformation is filmed directly by the camera once fitted prostheses.

Much of the work is transferred to post-production for digital de-aging. Visual effects artists examine the footage in detail months following the filming, dropping the actor's image into each frame, tweezing his or her face to digitally 'de-age' them. This process is complex, requiring sophisticated VFX teams and rendering software.

Table 4. Production Workflow Comparison: Practical Prosthetics vs. Digital De-Aging

Production Factors	Practical Prosthetics	Digital De-Aging
Main production stage	Pre-production and filming	Post-production
Specialists involved	Makeup sculptors, artists	VFX artists, animators
Time investment	Long daily makeup process	Long post-production editing
Budget allocation	Makeup department	Visual effects department

7.AUDIENCE PERCEPTION AND THE 'UNCANNY VALLEY'

A key factor of evaluating the success of any cinematic "makeover" is the audience response. When watching a film, human faces naturally attract the viewer's attention. Therefore the most important requirement is for the "the face" to appear realistic. Practical prosthetics tend to get round the problem called the "uncanny valley" in which a computer generated face seems just a little bit off.

Digital de-aging can sometimes approach the uncanny valley when a digital face does not equal the actor's body language or emotion accurately. A subtle feeling of artificiality may be created from even the slightest changes in skin texture or eye movement.

Table No. 5: Comparative Analysis of Audience Reactions to Practical Prosthetics vs. Digital De-Aging

Audience Reaction	Practical Prosthetics	Digital De-Aging
Emotional authenticity	Usually very convincing	Depends on VFX quality
Risk of uncanny valley	Very low	Moderate
Viewer immersion	Strong	Varies by execution

In summary, either approach is a useful technique that can be utilized for a cinematic makeover. Prosthetic effects can create the illusion of physical authenticity and be built into the actor's performance, whereas digital solutions can provide a high level of efficiency in changing the performer's age and look on two different time frames. Today's filmmakers, more and more, are using a combination of both methods, with prosthetic make-up serving as the foundation, and digital visual effects completing the look in the editing studio.

8.CONCLUSION AND INDUSTRY IMPLICATIONS

Comparing practical prosthetics and digital de-aging demonstrates how the old technologies are still functioning alongside new, modern ones. Both alter the face and body of the characters throughout the movies but they do so using very different techniques. Prosthetics work on an actor's face by physically applying materials that are textured and painted to resemble the face that is being created, during the shoot. Digital de-aging is very much a visual effects process that is applied to the characters post shoot.

Practical prostheses have a long history in cinema, and they remain extremely useful given their tangible, physical nature. Prostheses are, by definition, on set so they will immediately have reactions to lighting, shadow and camera movement. This

physicality frequently lends an authenticity which is readily absorbed by audiences. Prosthetic makeup also enhances the actor, allowing them to physically inhabit their character's new face. Watching their face change in the mirror helps the actor settle into their new part with changes to posture, voice, and expression. The success of prosthetic design on film may be seen in *Darkest Hour* and *The Whale*.

Digital de-aging is a relatively new step in the film technology process. Digital effects allow filmmakers to manipulate an actors' apparent age without having to apply layers of makeup or cast a different actor altogether. This allows stories to span different periods of time with the same character. The *Irishman*, a recent film from Netflix and Martin Scorsese, used digital de-aging to have the same actors portray the same characters over several decades. Not only is this a technique that gives filmmakers a lot of creative freedom, but it presents a number of challenges in visual realism and visual literacy. Many elements have to be digitally re-created in their digital effect so that the shot does not appear "cheap" and obviously manipulated; details like skin, muscle tone, lighting, and motion all play a role.

This paper also demonstrates though that neither of these two techniques can entirely substitute the other, rather they have their own advantages and disadvantages based on requirements of the production. Prosthetics are most suitable to be used when interaction, texture and realism areas of concern while digital de-aging provides efficient results when characters need to portray the aged-state varying by a long time span. In fact, nowadays several films are partially using the 'blended' technique where prosthetics were used along with digital enhancement to mitigate the severity of the effect as shown in the following film production. (Cramer, 2026)

Digital technology is still developing. Therefore, the significance of visual effects in the future of cinematic transformation is also likely to become even more prominent. (Smith, 2023) The manipulation of digital characters is gradually progressing in its realism and conviction through the use of state-of-the-art computers, such as AI, and facial capture systems, and more capable software systems for rendering. However, the useful craftsmanship and artistry of prosthetic makeup are still greatly valued in the film industry. Practical makeup artists' skills could not be imitated by digital production methods for the time being. So the cinematic transformation in the future is more likely to be a balancing act between the artistry and digital technology.

In brief, the understanding of practical prosthetics versus digital de-aging allows us to see how cinema keeps changing with the use of current technology and amateur or professional skills of filmmakers. Both practical and digital tech tools serve to be useful in a visual story-telling environment that would help to rebuild the human body and develop characters within a story. Instead of looking at them as rival techniques, we might

look at them as broaden techniques to give more options in the field of visual story-telling. With the fast developing new technology, creativity and technical knowledge of entertainment industry, the finding of the perfect mix of the practical and digital technique could be highly achievable in the near future

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