

Background Scene Enlargement in Selfie Video through Deep Neural Network: A Survey

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Abstract— Among the many opportunities of social media, selfies appear as an element with an especially high potential for self-presentation and impression management: Per se, selfies put the focus on the self. The selfie cam provides control while taking the picture; photo editing does the rest. With the person's face in the foreground, selfies can be very expressive pictures, convey emotions and an image as desired. Altogether, selfies thus seem to provide best opportunities for strategic self-presentations and impression management. Selfie photography from hand-held camera is becoming a popular media type. Although being convenient and flexible, it suffers from low camera motion stability, small field of view and limited background content. These limitations can annoy users, especially when touring a place of interest and taking selfie videos.

Using a video of the environment that has partial content overlap with the selfie video, we stitch plausible frames selected from the environment video to the original selfie frames, and stabilize the composed video content with a portrait-preserving constraint.

Index Terms—Hand-held video editing, Selfie, Video stitching

I. INTRODUCTION

“A photograph that one has taken of oneself, typically one taken with a smartphone or webcam and shared via social media”

This is the definition of the selfie that was created by the Oxford Dictionary in 2013. Two important elements from this definition are the front-facing camera and the distribution of images through social media. These two variables make selfies different from other, earlier, media of self-imaging. The front-facing camera of a smartphone allows an individual to simultaneously see their reflection and record it.

They are often casual in nature (or made to appear casual). "Selfie" typically refers to self-portrait photos taken with the camera held at arm's length, as opposed to those taken by using a self-timer or remote. A selfie, however, may include multiple subjects. As long as the photo is being taken by one of the subjects featured, it is considered a selfie.[1]

In October 2013, Imagist Labs released an iOS app called Selfie, which allows users to upload photos only from their front-facing smartphone camera.[2] The app shows a feed of public photos of everyone's selfies and from the people they follow. The app does not allow users to comment and users can only respond with selfies. The app soon gained popularity among teenagers. In describing the popularity of the "foot selfie",

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a photograph taken of one's feet while sunbathing at exotic locations, *The Hollywood Reporter* said that it could be "2014's social media pose to beat". In April 2014, the advertising agency I Strategy Labs produced a two-way mirror capable of automatically posting selfies to Twitter, using facial recognition software.

The appeal of selfies comes from how easy they are to create and share, and the control they give people over how they present themselves. Many selfies are intended to present a flattering image of the person, especially to friends whom the photographer expects to be supportive.[3] Those selfies would be taken on trips, during activities that are considered interesting or as a group selfie with interesting or attractive people. However, a 2013 study of Facebook users found that posting photos of oneself correlates with lower levels of social support from and intimacy with Facebook friends (except for those marked as Close Friends).[4] The lead author of the study suggests that "those who frequently post photographs on Facebook risk damaging real-life relationships." The photo messaging application Snapchat is also largely used to send selfies. Some users of Snapchat choose to send intentionally-unattractive selfies to their friends for comedic purposes.

II. FACIAL DISTORTION EFFECT

Because they are typically taken much closer to the subject's face than a conventional photograph, phone selfies tend to distort the subject's face. When conventional photographers take head shots, they typically use a narrower lens (or zoom in) and stand at a normal distance, instead of getting physically closer to the subject's face. Front-facing cell phone cameras, on the other hand, feature wide-angle lenses and are held closer to the face, since the human arm is only so long. This results in extension distortion, where objects closer to the camera appear much larger than they actually are. Though this distortion has a slimming effect, it also exaggerates the auto-photographer's nose and chin, since those parts are closer to the camera than the rest of the face.

III. LITERATURE SURVEY

To explain potential differences in ratings between selfies compared to photos taken by others, the warranting principle (Walther and Parks, 2002) can be drawn upon. Simply put, this principle assumes that individuals mistrust information that can easily be manipulated. In the context of selfies, one can argue based on the warranting principle that individuals should distrust selfies to a greater extent than photos because selfies are apparently easier to manipulate than photos. Research investigating the warranting principle in the context of Facebook found that information generated by individuals

other than the profile owner can increase the profile owner's social and task attractiveness and credibility (Walther et al., 2008) and his or her physical attractiveness as well as extraversion and introversion, respectively (Walther et al., 2009).

Our work is closely related to video stabilization, image and video stitching and selfie photographic editing. Here we limit our discussion to state-of-the-art or representative approaches. Video stabilization, Hand-held video commonly includes shaky or jittery content. Stabilization techniques have been proposed to stabilize video content by recovering camera paths using 2D and 3D method or a hybrid of both, producing a new stable camera path, and rendering the corresponding content. 2D video stabilization methods estimate Homography or Affine transformations between consecutive frames and smooth these transformations temporally [2-4].

Camera motions are learned for video stabilization [9] or shot classification [10]. Recently, bundled 2D camera paths were explored as a powerful tool for dealing with parallax [2]. These were later adopted for real-time stabilization [11]. 3D-based methods reconstruct the scene using point clouds followed by a 3D camera path planning [12], [13]. Full 3D reconstruction can be relaxed by leveraging partial 3D information from long feature trajectories [1], [14]. A hybrid 2D-3D approach was proposed to stabilize 360° video [15]. Generally, 2D-based stabilization methods are more efficient and robust, while 3D-based methods could generate better results. In our joint stabilization and stitching approach, we adopt the 2D bundled cameras idea to estimate initial local camera poses, followed by portrait-aware spatial-tempo mesh-based warping.

Video stitching: In early video stitching works, multiple video clips were composed as a mosaic [16]. For videos captured by multiple static cameras, Agarwala et al. [15] proposed to generate panoramic video texture from a single panning camera, using a min-cut optimization. Perazzi et al. [23] proposed a method that automatically determines the stitching order of structured videos to better hide parallax. Jiang et al. [4] proposed a content-preserving warping method to stitch multiple videos. These methods are restricted to structured camera arrays.

Recently, hand-held video stitching and stabilization attracted much attention from researchers. Lin et al. [24] used 3D-based method with scene reconstruction and virtual path optimization for stabilization and further mesh-based warping for stitching. Later, Guo et al. [5] proposed a 2D-based method which optimizes the virtual camera path and the stitching using bundled cameras [2]. Previous methods assume that the videos have already been synchronized, which in our case is not guaranteed. Moreover, the camera paths to be stitched could be different in both moving directions and angles. Before stitching, we carefully select candidate frames from the environment video with coherent camera motion while maintaining smoothness. Further, we designed an energy function for optimizing mesh layout so that we obtain temporal smoothness, spatial alignment as well as undistorted portrait content in the resulting video, without explicitly optimizing camera path in a separate step.

Selfie photographic editing: Selfie photography gained more popularity in recent years with the development of mobile photography devices. Because of this, selfie photographic editing has also become a hot topic. Such media types share particular characteristics: large portrait ratio, limited field-of-view with little (occluded) background and low temporal stability in video. Shen et al. [25] proposed to automatically segment foreground portrait from selfie photo using convolutional networks.

IV. THE POTENTIAL VALUE OF SELFIES: FROM SELF-EXPLORATION TO SELF PRESENTATION

At first, and apart from a social dimension, self-portraiture and selfies may be seen as a means for self and identity exploration.

Rutledge (2013) highlights the function of selfies as a trigger for self-study and self-observation, supporting our need to “figure out who we are and what we are whether you are trying to find greater consciousness or figure out what moved you to buy the blue shoes. we can look back on our motives and actions and gain insight we couldn't get in any other way.” This inward perspective, however, seems only a small part of the picture. In general, the outward orientation and public presentation seems an essential part of selfies, considering that most people do not take selfies just for themselves. More often, the envisioned audience seems already present while taking the selfie, and people deliberately use self-photographs to form a particular impression.

Lyu (2016), for example, explored impression management in the context of travel selfies shared via social networks, revealing how tourists strategically adjust photographic images to manage their impressions and highlighting the role of posting selfies as strategic self-presentation behavior. In line with this, existing definitions of selfies in research (Sorokowski et al., 2015) or the Oxford English dictionary, explicitly mention that selfies are usually shared via social media, or describe selfies as “the posting of self-photographs” (Barry et al., 2015).

In order to better understand the value of selfies as a form of online self-presentation, previous research on social media offers a helpful starting points, especially since sharing photos has become a key feature in social networks (Weiser, 2015). For example, studies regarding the example of Facebook, already examined the benefits for identity construction and implicit identity claims through one's profile photo and other pictures (Zhao et al., 2008), the use of self-promotional content features and its relation to narcissism and self-esteem (Mehdizadeh, 2010), the benefit of online social technologies for identity experimentation and self-disclosure (Best et al., 2014), as well as the challenges of managing multiple self-presentations via different services and profiles (Brivio and Ibarra, 2009).

Another strand of research explored relations to self-esteem and wellbeing. Here, studies showed a positive effect of selfies on self-esteem through the possibilities for selective self-presentation in social media, as for example, editing or examining one's own Facebook profile (Gonzales and Hancock, 2011; Toma, 2013).

Visiting the Facebook profiles of others, however, can have rather negative impact on well-being, especially if Facebook friends are not personally known: while neglecting that this selective view does not represent the “true life” of others, one comes to the depressing conclusion that others must be happier and having better lives (Chou and Edge, 2012). Thus, the same effect that boosts our self-esteem when pimping our own profile and presenting a highly selective, favorable insight in our life, may fire back when visiting the profiles of others.

In general, online-self presentation via social media profiles, blog posts, etc., is much more controlled than self-presentation in offline environments, since the former can be edited and revised before making it public, with lots of opportunities to manage the image perceived by others (Stănculescu, 2011). Within this, selfies push the opportunities for managing others’ view of oneself to the limit and provide some degree of new independence and control. One can get a quick picture of oneself, anywhere, at any place, without help from others. While taking a photo of oneself via camera held at arm’s length was already possible before the age of smartphones, smartphones and specialized selfie-equipment have brought this form of self-photography to perfection. One not only selects particular pictures for self-presentation but also already starts the ‘management’ process in the very moment of snapshotting one’s life. With the selfie-cam, acting as a mirror, the over controlled self-presentation in social media already starts while taking a photo.

Investigations in relation to individual differences in strategic self-presentation behavior lent further support to selfpresentation as a central motive for social media use. Błachnio et al. (2016) explored relations between individual tendencies for different self-presentation styles (e.g., self-promotion, self-depreciation) and Facebook usage and found a positive correlation to the individual tendency for self-promotion [18-19].

Thinking about the specific value of selfies, relations between the individual engagement in taking and posting selfies and individual self-presentation strategies are conceivable as well.

V. SELF-REFLECTION ON SELFIES

From an analytical point of view, self-presentation may be one of the most prominent psychological reasons for taking selfies.

However, another interesting question is how people reflect on this issue themselves: Do they see selfies primarily as a tool for self-presentation? Where do they see advantages and disadvantages of selfies in their daily life? How do they reflect on their own and others’ selfie taking behavior?

So far, only little research has explored personal reflections and subjective motivations for taking and posting selfies. An exception is the study by Sung et al. (2016), which explored motivations for posting selfies by an online-survey and a prior interview study. The interview study revealed four primary motives, namely attention seeking, communication, entertainment, and archiving, which each were assessed by a 3–6 items in the online-survey. Among the four motive scales,

attention seeking (sample items: “To show off,” “To be acknowledged by others”) seems to have the highest overlap with self-presentation. While the motives attention seeking, communication, and entertainment were positively related to narcissism and selfie-posting frequency, archiving was not.

In an own qualitative study (N D 86, see also Christoforakos and Diefenbach, 2016), we explored peoples’ subjective associations with selfies, thereby distinguishing between perceived positive and negative aspects of selfies. Both aspects were surveyed by an open question format and categorized by qualitative content analysis. Overall, the most common positive associations were independence (taking self-portrait pictures without help from others), meaning/documentation (selfies as a marker of meaning, selfies as memories), relatedness (feeling close to people when seeing their selfies), control/selfstaging (control over the picture and the image perceived by others), and positive feelings (e.g., fun, chasing boredom). In contrast, as the most negative consequences of selfies participants named illusion/fake (inauthentic, unnatural pictures, creating a superficial illusionary world), threat to self-esteem (e.g., risking negative reactions from others, vulnerability), negative impression on others (e.g., narcissistic, showy), bad quality pictures, and unnecessary/uninteresting pictures. Hence, our findings on positive associations generally show parallels with the study on selfie motivations by Sung et al. (2016), e.g., relatedness – communication, meaning/documentation – archiving, positive feelings – entertainment. However, the aspect of control and self-staging was brought up more explicitly in our study, and also the aspect of independence as a positive consequence of selfies was not discussed by Sung et al. (2016).

Moreover, an interesting tendency in our qualitative data (Christoforakos and Diefenbach, 2016) was a different form of argumentation when talking about one’s own selfie habits (e.g., “for me, it is a form of documentation”) versus others taking selfies and general judgments (e.g., “the people get more narcissistic”). Not all statements were clearly indicative of self-versus other judgments, since the study did not explicitly ask for this differentiation. However, those statements that did, showed a focus on situational and practical reasons for taking selfies oneself (e.g., “a quick photo without needing help from others,” “using the selfie-cam as a mirror”) whereas other judgments rather referred to reasons lying in the person (e.g., self-admiring, narcissistic), depicting the prototypical selfie-taker as the “type of character who needs it.”

We took this, as a hint for a more systematic exploration of judgments for own selfies versus others ‘selfies and peoples’ reflections on selfies as a societal phenomenon. In general, the exploration of interpretations and attributed reasons for taking selfies can offer deeper insight into the psychology and subjective experience of selfies.

VI. PHONE CAMERA

A camera phone is a mobile phone which is able to capture photographs and often record video using one or more built-in digital cameras. The first camera phone was sold in 2000 in Japan, a Sharp J-SH04 J-Phone model,

although some argue that the SCH-V200 and Kyocera VP-210 Visual Phone, both introduced months earlier in South Korea and Japan respectively, are the first camera phones.

Most modern smartphones only have a menu choice to start a camera application program and an on-screen button to activate the shutter. Some also have a separate camera button, for quickness and convenience. A few camera phones are designed to resemble separate low-end digital compact cameras in appearance and to some degree in features and picture quality, and are branded as both mobile phones and cameras. The principal advantages of camera phones are cost and compactness; indeed for a user who carries a mobile phone anyway, the addition is negligible. Smartphones that are camera phones may run mobile applications to add capabilities such as geotagging and image stitching. Also, smartphones can use their touch screens to direct their camera to focus on a particular object in the field of view, giving even an inexperienced user a degree of focus control exceeded only by seasoned photographers using manual focus. However, the touch screen, being a general purpose control, lacks the agility of a separate camera's dedicated buttons and dial(s).

Camera phones have also been very useful to street photographers and social documentary photographers as they enable them to take pictures of strangers in the street without them noticing, thus allowing the artist/photographer to get close to her or his subjects and take more livefull photos.

Smartphones can use their front camera (of lesser performance as compared to rear camera) facing the user for purposes like self-portraiture (selfie) and videoconferencing. Smartphones can usually not fix on a tripod, which can make problems at filming or at taking pictures with long exposure times.

VII. CONCLUSION

To our knowledge, this paper presents the first approach to handle the selfie video expansion problem. As the present study showed, self-presentation may be a central factor for the attractiveness of selfies but at the same time is downplayed in self-reports. While many people are contributing to the success of selfies, only few declare true commitment. In the end, however, the combination of these two factors, an opportunity for self-presentation without an obvious revelation of self-presentational needs, may also be part of the secret of their success.

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