MojiBoard: Generating Parametric Emojis with Gesture Keyboards

Jessalyn Alvina, Chengcheng Qu, Joanna Mcgrenere, Wendy Mackay

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Jessalyn Alvina*
Dept of Computer Science
University of British Columbia
Vancouver, BC, Canada
jalvina@cs.ubc.ca

Chengcheng Qu†
Dept of Computing and Communications
Lancaster University
Lancaster, United Kingdom
c.qu3@lancaster.ac.uk

Joanna McGrenere
Dept of Computer Science
University of British Columbia
Vancouver, BC, Canada
joanna@cs.ubc.ca

Wendy E. Mackay
LRI, Univ. Paris-Sud, CNRS,
Inria, Université Paris-Saclay
Orsay, France
mackay@lri.fr

ABSTRACT

Inserting emojis[1] can be cumbersome when users must swap through panels. From our survey, we learned that users often use a series of consecutive emojis to convey rich, nuanced non-verbal expressions such as emphasis, change of expressions, or micro stories. We introduce *MojiBoard*, an emoji entry technique that enables users to generate dynamic parametric emojis from a gesture keyboard. With *MojiBoard*, users can switch seamlessly between typing and parameterizing emojis.

CCS CONCEPTS

• **Information Systems** → **User Interfaces**; **Interaction Styles**.

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*Also with, LRI, Univ. Paris-Sud, CNRS, Inria, Université Paris-Saclay.

†Also with, LRI, Univ. Paris-Sud, CNRS, Inria, Université Paris-Saclay.

[1]A set of two-byte pictographic unicode characters. Not to be confused with emoticons: a representation of a facial expression e.g. :) formed by various combinations of characters. See www.unicode.org/emoji for further details.

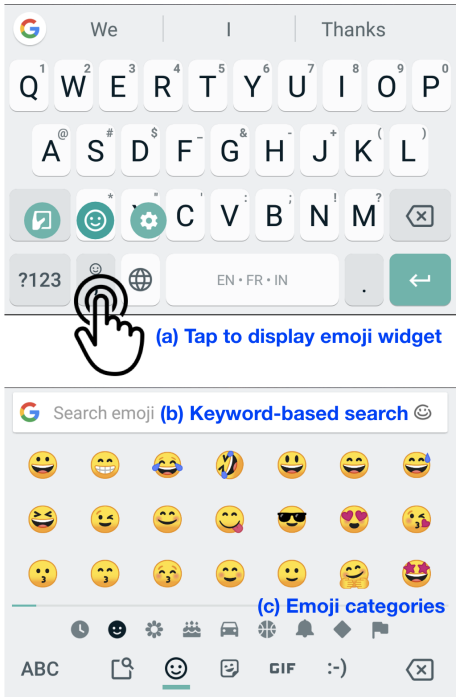

Figure 1: (a) To insert an emoji, first tap a button to display the emoji widget, then search for the desired emoji while swapping panels. Alternatively, filter emojis by (b) typing a keyword on the search bar, or (c) tapping an emoji-category tab to jump immediately to the panel associated with that category. This process is cumbersome and can disturb the flow of writing.

[2]https://play.google.com/store/apps/details?id=com.google.android.inputmethod.latin&hl=en

KEYWORDS

emoji; continuous interaction; expressive communication; gesture input; gesture keyboard; mobile

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INTRODUCTION

Around 40% of mobile activities involve text-based communication [3]. Prior research focused on improving text input efficiency, for example improving typing speed, word prediction, or spelling and grammar. However, text messaging is not simply about producing text: users also appropriate it to support other forms of non-verbal expression. In particular, emojis, such as 😊, are often substituted for individual words or used to supplement the text. Lee at al. identified three common patterns of emoji use: 1) to express emotion, e.g. context, intensity, and emphasis; 2) for strategic reasons, e.g. reaction, self-representation, impression formation and social presence; and 3) for functional purposes, e.g. as a substitute for or a supplement to text [6].

Most text-messaging applications on mobile devices let users choose from a long list of emojis, including animated ones, to insert into their conversations. Due to limitations of screen real estate, these lists appear on multiple panels, sorted by category, such as 'face', 'animal', and 'flag'. (For example, see GBoard[2] in Fig. 1). This entry technique is inefficient and cumbersome: users must perform a linear search task while swapping among different panels [7, 8], and the text entry rate declines significantly the more panels are swapped. EmojiZoom [8] tried to address this issue by displaying all emojis at a smaller scale in one panel, enabling a focus+context exploration. Even so, the context panel can only include a certain number of emojis before the scale is too small for effective exploration. When users insert rarely used emojis [7] or include a series of identical or different consecutive emojis [4], the corresponding emoji entry rate is likely to drop even further.

We are interested in simplifying emoji entry while adding greater emoji expressivity, in a fun and easy-to-learn way. We first sent out a questionnaire to better understand emoji use. Then, based on the results, we designed *MojiBoard*, an emoji input technique that lets users take advantage of gesture typing to quickly enter and adjust the parameters of animated emojis, eliminating the cost of panel swapping while adding fine control over the resulting expression.

Participants
Age Group: 77% 18–25 years old; 18% 26–35 years old; 5% 36–45 years old.
Sex: 44% men; 42% women; 14% not specified.
Mobile Platform: 72% iPhone; 28% Android.

Sidebar 1: Demographic information.

PID	Emojis	Reported Meaning
	Emphasizing with the same emojis	
P55	😘😘	"To describe *more than usual* affection or constant affection"
P35	👍👍👍	"*Strong* approval"
P1	😂😂	"*Exaggerating*, or *duration* sometimes"
	Micro-stories with different emojis	
P31	👏🏻👏🏻👏🏾👏🏾	"Applause"
P7	😨😱😢	"Oh no"
P15	🙈🙈🙈	"Don't know"
P51	😓😔	"Sad"
P51	👍👍👌	"Okay/good"
P51	😂😂🙈	"Ridiculous"
P9	😶😶😶🙅	"Speechless"
P36	😉😌😑	"Wonderful"
P53	😉😛😈	"Flirting"
P46	😈😈🤓	"Being evilish yet clever (e.g. Trying to convince someone)"
P22	😈💩	"Haha"

Figure 2: Consecutive emojis in text messages are often used to express 1) emphasis, unusual occurrence, duration; or 2) complex emotions or micro stories. (PID=Participant ID)

STUDY: QUESTIONNAIRE ON EMOJI USE

We sent a questionnaire to 62 unpaid participants to understand their use and appropriation of emojis in text-messaging apps. Participants were mainly young adults who text their closest friends and family: 41% mostly send messages to their partner, 31% to best friends or siblings, and 12% to other family members. Only 16% of the participants mentioned that they used text messaging most often in a professional context, e.g. to colleagues or employers. Our participants are heavy users of text-messaging apps: 96.8% messaged their primary texting-partner at least once per day, and 38.7% of the participants messaged their texting-partner more than 6 times a day.

A particularly interesting result was the participants' use of sequences of consecutive emojis to express an intense emotion. We asked how often they did this, and which patterns they used, either sequences of the same emoji, e.g. 😂😂😂, of different emojis, e.g. 😉👏🏻🎉, or a mix of both. The majority of the participants (75%) reported regular use of emoji sequences: 61% rated this at least 3 in a 1-to-5 scale of frequency of use (1='Never', 5='Constantly'). Of these, 37.2% use sequences of the same emoji, 32.6% use sequences of different emojis, and the remaining 30.2% use both. This suggests that young adults are not only motivated to use emojis, but also spend the time needed to create sequences of emojis when they text their closest friends and family.

We used Pohl's [7] classification to assess emoji similarity. Some participants, e.g. P7, P15, P51, combined similar emojis to express a rich, complex emotion, for example "🙈🙈🙈" to express a feeling of having no clue or "don't know". Others used sequences of completely different emojis to express subtle changes of emotion, e.g. P53's "😉😛😈"; or to describe a story or an action, e.g. P46's "😈😈😎", (see Fig.2). These young adults create sequences of emojis to convey richer, nuanced meanings that are not easily captured by a single emoji, which suggests a design opportunity: How can we help users form emojis with greater expressivity in a fun, simple and easy-to-learn way?

MOJIBOARD

Background Rationale

To increase the nuance of expressive typed text, Lee et al. [5] added command buttons into a desktop text-messaging app, which create animated text that changes in color, size, or position over time. *Expressive Keyboards* [2] use a gesture keyboard [9] to generate rich, expressive text output, e.g. font and color, based on gesture properties such as speed. Some emoji entry systems, e.g. *GBoard*, allow users to type a keyword to filter emojis via the emoji search bar (Fig. 1). Pohl et al. found that users often jump immediately to another category if the first panel displayed does not contain the desired emoji [7]. This suggests that some users can *recall* the category name or the keyword associated with the desired emoji.

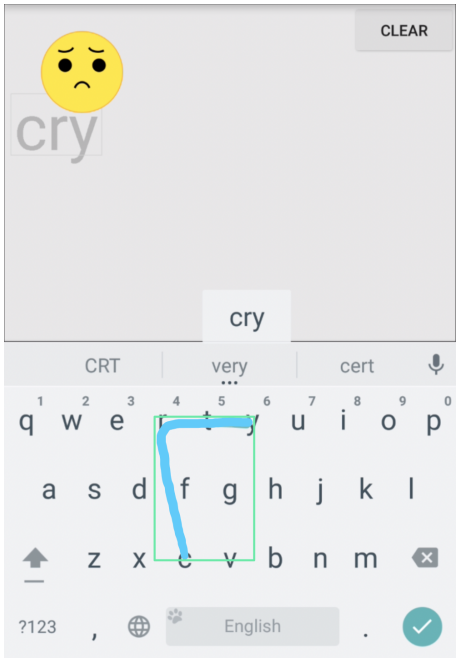

Figure 3: *MojiBoard* augments the *CommandBoard*'s gesture keyboard to handle both text and emojis. Users gesture type to insert text; if the word corresponds to an emoji keyword, e.g. "cry", an emoji preview appears. Lifting the finger from the keyboard inserts the word "cry" and removes the preview. Continuing the gesture into the space above the keyboard, followed by an 'execute' /\ gesture, inserts the previewed emoji. This lets users rapidly switch between text and emoji insertion, without swapping panels.

CommandBoard [1] takes advantage of the user's ability to recall command names: users simply gesture-type the command, followed by an 'execute' /\ gesture above the keyboard, to invoke it. Gestures that stop within the keyboard area are interpreted as words, whereas gestures that end in the space above are interpreted as commands. Given the evidence that users recall emoji keywords, they should be able to "*just type the emoji*" from the keyboard without switching to an emoji widget. This not only eliminates the search cost, but also opens new possibilities for adding expressivity to the resulting emojis, since we can now map the characteristics of each gesture to parameters associated with the emoji.

MojiBoard Design

We introduce *MojiBoard*, that augments the *CommandBoard* [1] to generate animated, parametric emojis. This enables users to convey nuanced meanings, such as changes in emphasis or varied emotions, or even tell "micro stories". Like the earlier *Expressive Keyboard* [2], we map gesture input variations to output parameters: Here, the emoji's expression changes according to how the user performs the gesture. We chose a gesture keyboard since it is already in widespread use; users can reliably control their gesture variation [2]; and unistroke gestures offer a potentially infinite number of input variations, especially when compared to a tap gesture.

MojiBoard establishes three discrete interaction spaces: keyboard, command bar, and upper space (Fig.5). The keyboard supports both text input i.e. typing and an emoji input space. To enter an emoji input, the user gesture types an emoji keyword, such as "cry", continues into the space above the keyboard, and draws a /\ gesture all in one single stroke (Fig. 4). *MojiBoard* thus expands the *CommandBoard*'s functionality to not only accept emoji keywords as a new type of command, but also to control its parameters so users can create personalized, animated emojis with a single unistroke gesture.

Generating Parametric Emojis. Most emoji systems use a set of keywords associated with each emoji, for example "smile" for 😊 and "sad, cry" for 😭. *MojiBoard* lets users gesture type emoji keywords for quick insertion into their text messages. When the user gesture types, the four most likely word candidates appear: the highest probability word is treated as the chosen word and the rest appear in the keyboard's suggestion bar (Fig.3), often, as auto completions to longer words (see Fig.5). *MojiBoard* progressively checks for emoji keywords and, in the case of a match, displays a preview of the associated emoji. To accept this emoji, the user slides into the space above the keyboard and performs the /\ gesture (Fig. 4). *MojiBoard* calculates the *size*, indicated by the green bounding box (shown in Figures 3 and 4), and the *curviness ratio* i.e. the radius of curvature, in real time. The bigger the bounding box, the bigger the emoji. Similarly, the curvier the gesture, the more intense the emoji's expression. Fig.3 shows a relatively small and straight gesture, which generates a sad face with a small

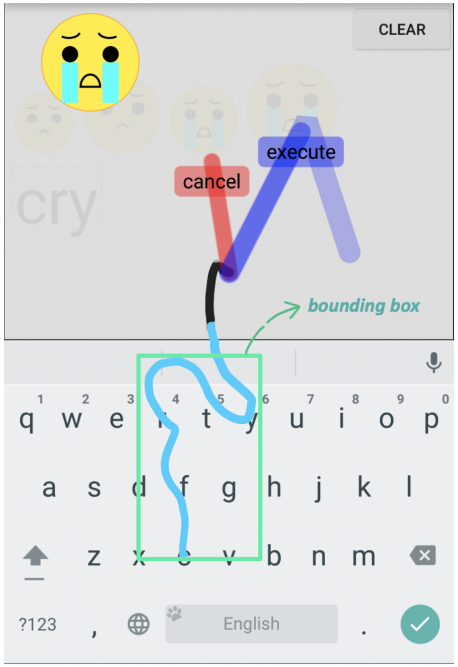

Figure 4: Generating a parametric crying emoji with *MojiBoard*. The user gesture types "cry" by drawing a wobbly, inflated gesture (inside the green bounding box), which generates a preview emoji (top left). The user continues drawing into the area above the keyboard. Following the blue 'execute' gesture and lifting the finger inserts the previewed emoji into the text. Following the red 'cancel' gesture aborts the command.

frown. As the user wiggles the gesture, which increases the curviness and the size of the bounding box, the emoji grows bigger and the expression changes from a small frown into a crying face (Fig.4).

The matching keyword is maintained until the finger is lifted or a different word is typed. This reduces the likelihood of accidentally changing the keyword when wiggling or inflating the gesture. If several emojis are associated with a particular keyword, the most frequent options appear in the *command bar* (Fig. 5) above the keyboard. The user can then cross through the desired emoji when moving into the upper area. *MojiBoard* considers each word in the phrase as potential emoji keywords, e.g. typing "tears" or "joy" displays the "face with tears of joy" 😂 emoji. The resulting emoji uses a two-second animation that transitions from a small frown to a crying face, producing a more dramatic expression. The user can tap the emoji to replay the animation, repeated three times, for a total of six seconds. To cancel emoji generation, the user draws a straight gesture above the keyboard (Fig. 4).

Selecting Random Emojis. In addition to generating animated parametric emojis, *MojiBoard* can also insert a series of random emojis, derived from the current set of categories. This offers a simple and fun method of creating 'micro stories' from rarely-used emojis. When the user type "random", *MojiBoard* displays a preview of all the emoji categories in the command bar (Fig.5). The user can cross through the categories they wish to include: Choosing two or more emojis from the same category involves exiting and then reentering the command bar at the desired locations. The preview displays the selected emojis, which the user can insert with the /\ gesture or cancel them immediately.

Technical Implementation

Current emojis are represented with a two-byte unicode character, and those generated by *MojiBoard* need not exceed a three-byte unicode character. For example, a parametric value such as the curviness ratio can be captured in a single additional byte. Each platform or text-messaging application must decide on how to render these emojis. *MojiBoard* illustrates changes in size and animation, but other possibilities can be included such as such as stickers, skin-tone modifiers, or GIF image parameters.

CONCLUSION AND FUTURE WORK

We found that users often use emojis to convey nuanced meaning, such as emphasis, emotion changes and 'micro stories'. *MojiBoard* lets users manipulate features of their gestures to modify the look of a parameterized, animated emoji, e.g. the intensity of its expression. Users need not search through emoji widget panels but can instead switch seamlessly between gesture typing and inserting and generating emojis. Users thus create highly personal emojis, whose expressions are mapped directly to their invididual gestures. We believe that future, more complete and sophisticated emoji engines could provide significantly more personalizable emojis. For example, while the random function for selecting novel emojis is fun, future work should explore alternate methods for creating micro stories,

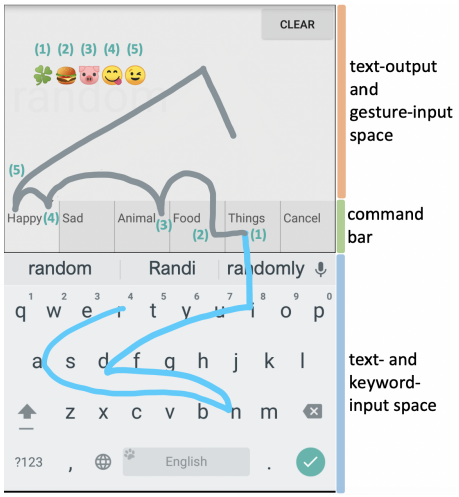

Figure 5: Inserting a series of random emojis based on categories. The user gesture types the keyword "random". *MojiBoard* auto-completes the gesture if the keyword already appears in the command bar: Here, typing "randi" is sufficient. The user moves back and forth through the command bar five times, to select five emojis from four categories.

or modifying non-human emojis such as 🎉. We can also consider how designers, or possibly even users, could control mapping between gesture variation and emoji parameters. This would significantly increase the potential for personalization and expressivity, while needing fewer bytes than inserting multiple consecutive emojis. Note that we believe *MojiBoard* should be considered an addition, rather than a replacement for current emoji systems, since users may still want to browse through panels of emojis or type keywords associated with pre-defined, static emojis. We hope to expand *MojiBoard* to include parameterization from both the keyboard and the emoji widget. We are particularly interested in creating a parametric emoji engine that interpolates across different expressions, e.g. from happy to shock to crying, and plan to conduct a field study to observe how users adopt and adapt *MojiBoard* in their daily conversations.

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