

# EMVIZ (flow): An Artistic Tool for Visualising Movement Quality

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**EMVIZ (flow) is an interactive artistic visualisation system that maps movement quality data to aesthetic visual representations. The goal of EMVIZ is to communicate complex movement information to an 'everyday' audience and support discernment of the experience of complex movement data. EMVIZ (flow) generates dynamic visual representations of human movement qualities derived from a framework of Laban Movement Analysis (LMA), a rigorous, analytical and embodied system for analysing human movement. Movement data is obtained from a real-time wearable sensor classifier supervised learning system that applies an LMA model to extract movement qualities from a moving body in the form of Laban Basic-Effort-Actions (BEA). This movement quality recognition system outputs a stream of Basic-Effort-Action vectors and EMVIZ (flow) maps this stream of data to an autonomous flocking agents system and colour palettes for creating visual representations of movement quality. EMVIZ (flow) was used in an improvised interactive dance performance at the Human Factors in Computing System (CHI) workshop 2011 and exhibited at a Simon Fraser University (SFU) Open House 2011 event. We describe an underlying model to capture and map movement quality to a visualisation system, a data mapping strategy, a generative algorithm, and an application used for visualising movement quality.**

*Dance visualisation. Aesthetic visualisation. Laban Basic-Effort visualisation. Movement quality.*

## 1. INTRODUCTION

The application of human movement within digital technology has been researched extensively, borrowing from many disciplines such as biomechanics, mathematics, anatomy, psychology, neuroscience, and visual and performing arts. Recent research projects in Human Computer Interaction (HCI) have investigated and explored how human movement can be integrated into digital technology contexts. This has resulted in the development of new models and techniques for capturing, analysing or visualising the complexity of human movement in various fields of art and computing such as interactive arts, game design, gestural interface design or robotics.

In our research, we are particularly interested in capturing and visualising information about movement quality. Movement quality is complex information that describes how movement is performed and perceived. However, the ability to critically discern, describe, and differentiate between movement qualities tends to be limited to experts who have experience or training in movement observation.

To date, several research projects have explored movement quality information, particularly how different sensors (e.g., acceleration, biometric or pressure) and computational techniques were used for capturing and analysing this complex information (Schiphorst & Maranan 2012). However, to the best of our knowledge, there has been little research in digitally representing or visualising movement qualities. In this paper, we present an artistic visualisation prototype called EMVIZ (flow), which generates abstract expressive visual representations of human movement quality. To design EMVIZ (flow), we employ research through art and design as the methodology for developing new design methods or artefacts through artistic practice (Frayling 1993).

This practice-based arts research was undertaken by the authors in collaboration with movement experts and computer scientists, in order to develop a visualisation system for representing movement quality information. The primary goal is to communicate movement quality information in expressive ways and to construct a framework that describes a design process for articulating movement quality visualisation. This has resulted in (1) an underlying model to capture and map

movement qualities to a visualisation system, (2) a data mapping strategy, and (3) a generative algorithm for visualising movement quality.

Section 2 describes the key concepts and surveys related works that inspire our design process for developing the EMVIZ (flow) visualisation system. Section 3 outlines our methods and tool for capturing and analyzing movement quality. Section 4 presents the EMVIZ (flow) system design and mapping strategy. Section 5 describes the system experiments and usage, and Section 6 discusses our conclusions and future work.

## 2. BACKGROUND

Human movement within digital technology has been researched and extensively explored by new media artists, interaction designers, musicians, and computer scientists in the HCI research community. This has resulted in the development of new technologies, models, and computational techniques for capturing, analysing, and mapping human movement information to other fields such as music, dance, and visual art.

In the movement and visualisation domain, a few projects have explored the complexity of human movement visualisation. Carlson *et al.* present a human movement analysis tool that visualises choreographic information in different pieces of contemporary dance choreography (Carlson *et al.* 2011). Palazzi *et al.* create an interactive screen-based visualisation application that unfolds choreographic structures by William Forsythe, one of the world's foremost choreographers (Palazzi *et al.* 2009). Raphael Perret creates a human movement visualisation sculpture that captures the aesthetic of human physical expression by abstracting intangible human movement into a physical aesthetic object (Perret 2009).

These three examples are human movement visualisation projects that present different methods of human movement visualisation application, from analytical tool to interactive screen-based project, and from interactive screen-based visualisation project to purely aesthetic objects. However, these projects were not designed to support real-time interactive visualisation or intended to reveal information about movement quality.

### 2.1 Human Movement Analysis

Laban Movement Analysis (LMA) is an analytical and embodied system for understanding human movement that was based on the work of Rudolf Laban and subsequently expanded by Irmgard Bartenieff (Bartenieff & Lewis 1980). LMA observes, analyses, and describes movement through four different components: Body, Effort, Shape and Space (BESS). Taken together, all four

components comprise a framework for movement analysis (Laban & Lawrence 1974).

In the LMA system, movement quality is defined through its Effort. Effort analysis categorises human movement quality using four parameters: Space, Time, Weight, and Flow. Each of these Effort parameters is a continuum bounded by two extreme values. The value at one end of the continuum is the result of "indulging" through the Effort, while the other is the result of "fighting" or "condensing" through the Effort (Laban & Lawrence 1974). Space is related to personal attention to the surrounding environment and the direct or indirect interaction with it. A multi-focused intent results in *Indirect* attention to movement, while purposeful singularly focused intent results in *Direct* movement. Time is related to personal decision or the mover's sense of urgency. A sense of lingering is represented as *Sustained* Time, while a sense of urgency is connected to *Sudden* Time. Weight is related to personal intention or the mover's sense of the impact of one's movement. A buoyant attitude creates *Light* Weight, while a vigorous presence creates *Strong* Weight. Flow is related to personal progression or the feeling of "aliveness" that is marked by the ability to move between mental states with fluency. A sense of abandon marks *Free* Flow and a feeling of restraint or precision marks *Bound* Flow.

Combining two parameters creates different *States*. For example, Space and Time together create the awake state. Combining three parameters creates different *Drive* movements such as the Action Drive (composed of Space, Time, and Weight), the Passion Drive (composed of Time, Weight, and Flow), the Spell Drive (composed of Space, Weight, and Flow), and the Vision Drive (composed of Space, Time, and Flow).

In everyday movement, some parameters are emphasized, while others are minimized (Laban & Lawrence 1974). For instance, when a mover is in what Laban calls the *Action Drive*, their attention to Flow is minimized. In the Action Drive, the extreme values of Space, Time, and Weight combine to create eight qualities, outlined in Table 1. These movement qualities are so prevalent in daily activity that Laban calls them the *Basic-Efforts-Actions* (Laban & Lawrence 1974). However, the *Basic-Efforts-Actions* outlined in Table 1 are not gestures alone. When one hand is waving to say hello, for instance, we could describe the movement as having a gliding or dabbing quality. Therefore, the *Basic-Efforts* can be used to describe movement or treated as qualitative descriptors of gestural movement.

**Table 1:** Effort parameters and their extreme values for each of the eight Basic-Efforts

Movement Parameter			Basic-Effort
Space <i>Intention or sense of the impact of one's movement</i>	Time <i>Decision or sense of urgency</i>	Weight <i>Attention to the surrounding environment</i>	
Direct	Sustained	Strong	Press
Direct	Sustained	Light	Glide
Direct	Sudden	Strong	Punch
Direct	Sudden	Light	Dab
Indirect	Sustained	Strong	Wring
Indirect	Sustained	Light	Float
Indirect	Sudden	Strong	Slash
Indirect	Sudden	Light	Flick

In this research, we are interested in the expressive aspects of human movement. Thus we focus our research on *Basic-Efforts*, the aspect of LMA that defines qualities of movement. In the LMA system, movement quality is defined through its Effort.

## 2.2 Artistic Visualisation

Visualisation is a term generally used to reference making the invisible, visible. In a computer graphics context, the term 'visualisation' is used in various interdisciplinary branches of science such as information visualisation, scientific visualisation, software visualisation, etc. However, another visualisation discipline has emerged from these interdisciplinary branches of science, inspired by art and technology domains such as new media art, digital art, interactive art, visual art or social sciences. This new discipline involves applied information visualisation techniques and tries to bridge ideas of art and computing to provide novel solutions for the visualisation community (Judelman 2004). This new field is often called artistic visualisation, aesthetic visualisation, aesthetic information visualisation or visualisation art.

Artistic visualisation characteristics and criteria have been widely discussed in the literature (Manovich 2008; Pousman *et al.* 2007; Sack 2011; Whitelaw 2008; Kosara 2007; Lau & Moere 2007; Ramirez 2008; Viégas & Wattenberg 2007 cited in Subyen *et al.* 2011a). These characteristics are categorised and summarised as follows:

- **Goal:** Artistic visualisation is defined by the intention to reflect, restructure, question, and explore issues related to a particular topic, with the goal of making art in order to abstract complexity of data or information into aesthetically pleasing visual representations in which the artist's concern is communicated.
- **Process:** Artistic visualisation design process focuses heavily on the concept that artists

want to reflect on their works. Artistic visualisation is defined by the use of interpretive mapping that involves subjective decisions or the use of visual metaphors that need not be easily deciphered. It sometimes employs systematic data mapping adopted from traditional information visualisation techniques. However, both mapping approaches are used with an intention to explore the creative design space by experimenting with different computational algorithms and design principles.

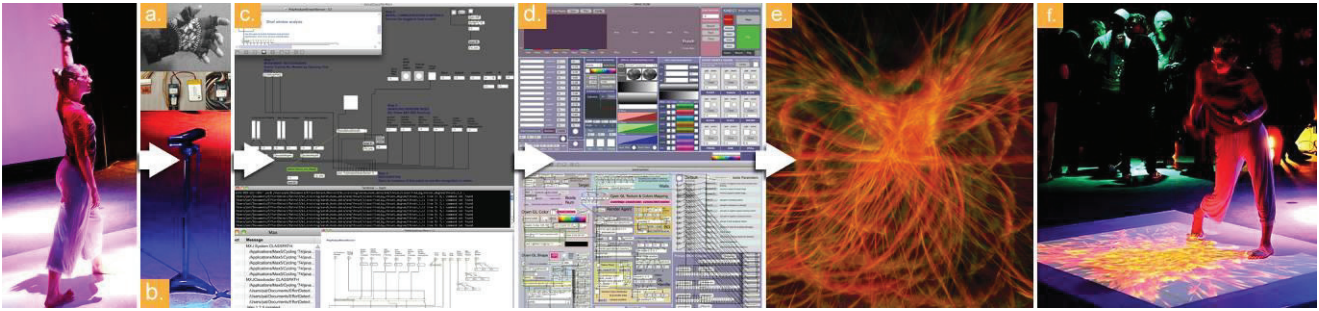
- **Output:** Artistic visualisation frequently makes use of design principles and computational techniques to (1) persuade or change the way people think or (2) to increase aesthetic perception through visual representation. It also puts the responsibility of imaginative interpretation on the viewer through their phenomenal observation of the visualisation artefact.

Our research project falls into the artistic visualisation domain, and the field's criteria and principles reinforced our artistic process in the development of the EMVIZ (flow) visualisation engine.

## 2.3 Agent-Based System

Agent-based system is a field of study examining the emergent behaviour of populations of artificial agents, which can be used as a process for generating graphical representations of data (Hutzler *et al.* 2000). Agent-based system has been researched and experimented with by artists, designers, and researchers as a method for representing information in the visualisation domain. For instance, Hutzler *et al.* present a computer-generated artwork that generates abstract visual representations of meteorological data (e.g., temperature, rain, clouds or wind direction) using multi-agent systems (Hutzler *et al.* 2000). Moere presents a flocking agents technique that represents complex time-varying datasets through visually recognisable formations and motion typologies (Moere 2004). Milam and Pasquier present an ambient visualisation system that uses autonomous flocking agents to visualise student population fluctuation on a university campus (Milam & Pasquier 2008).

Similarly, we use agent-based system (i.e., autonomous flocking agents) as a technique in EMVIZ (flow) to generate visual representations of movement quality. This raises the question of how agent behaviour can be designed to generate different motion patterns (emergent patterns of behaviours) that convey or represent movement quality information.



**Figure 1:** A system diagram of EffortDetect and the EMVIZ (flow) system. (a) The wearable hardware system (glove). (b) Microsoft Kinect tracking hardware system. (c) EffortDetect software interface. (d) EMVIZ (flow) software interface. (e) Visualisation output from system. (f) Punch Effort visualisation performed by a dancer

### 3. RECOGNIZING MOVEMENT QUALITY

In order to recognise and generate movement quality data, we use a real-time classifier supervised learning prototype called EffortDetect, which recognises movement qualities from a moving body.

EffortDetect is a movement quality recognition system that applies Laban Movement Analysis (LMA) by using a supervised learning algorithm. EffortDetect was originally developed by the University of Illinois Institute for Advanced Computing Applications and Technologies and the university's Dance Department, in collaboration with Dr. Thecla Schiphorst at Simon Fraser University's School of Interactive Arts and Technology (Pietrowicz *et al.* 2010). We have adapted and iterated this initial research (Maranan *et al.* 2012).

EffortDetect has two components: a wearable hardware system in the form of a glove (Figure 1a) and a software system (Figure 1c). The wearable hardware system consists of an accelerometer, a microcontroller, and a radio transmitter that transmits a stream of acceleration data generated by the accelerometer. A software system—built using Max/Msp and the Weka Java API—takes the stream of acceleration data, translates it into a stream of extracted higher-level motion features, and then feeds the motion features into a trained machine-learning system (Laban Effort Classifier) that recognises or classifies patterns in the motion feature stream (Maranan 2010). EffortDetect outputs a stream of *Basic-Effort-Actions* (BEA) vectors at a sampling rate of 100 samples per second. Each BEA vector movement profile consists of eight float-number values between 0 and 1, representing the system's confidence in a *Basic-Effort's* presence in the movement (e.g., Dab=0.035, Flick=0.442, Float=0.025, Glide=0.00, Press=0.1201, Wring=0.016, Slash=0.0110, Punch=0.0451). When we use EffortDetect in a dance performance, it is integrated with a tracking

hardware system built on the Microsoft Kinect sensor to provide arm position data (X, Y, Z) in association with the BEA vectors stream (Figure 1b).

We map values of each BEA vector to autonomous flocking agents computational parameters and colour palettes (described in Section 4) to create a meaningful visual representation of movement quality. EMVIZ (flow) uses this stream to generate visualisations. Figure 1d presents the EMVIZ (flow) visualisation engine software interface.

EffortDetect's wearable hardware system was used in a live performance of choreographer Trisha Brown's piece, *Astral Convertible*, at the University of Illinois at Urbana Champaign. Dancers performed choreographic material that was accurately recognized by software built on the same backend as EffortDetect (Pietrowicz *et al.* 2010). EffortDetect was also successfully used in a series of interactive installations and live performances to generate visualisation (Subyen *et al.* 2011a & 2011b).

### 4. SYSTEM IMPLEMENTATION

The EMVIZ (flow) prototype has been developed using Max/Msp Programming Environment. In order to create a visualisation system that responds in real-time to movement in dance performance, the EffortDetect system was incorporated with the Microsoft Kinect tracking hardware system (Figure 1b). Figure 1e shows a sample output from EMVIZ (flow) for the *Punch Basic-Effort* performed by a dancer (Figure 1f).

#### 4.1 Autonomous Flocking Agents

To create visual representations of movement quality, EMVIZ (flow) design strategy is motivated by the desire to combine three domains described in Section 2: artistic visualisation, LMA's eight *Basic-Effort* theory, and agent-based system.

Boids Computational Parameters	Parameter Exploration	Basic-Effort Design Rules	Motion Pattern and Shape
● <b>Neighbours:</b> number of neighbours each boids consult when flocking	Experiment with Adjusting Boids Computational Parameter Values	<b>Press</b> Strong + Direct + Sustained	Slow, focused, forceful, and straight lines or dots with linear motion outwards from centre
● <b>Accel:</b> acceleration or deceleration rate		<b>Glide</b> Light + Direct + Sustained	Calm, focused, soft, and slow lines or dots with linear motion toward upper right or left
● <b>Match:</b> Strength of neighbour speed matching instinct		<b>Punch</b> Strong + Direct + Sudden	Fast, intense, dense, focused, and straight forceful lines or dots with linear, radial, or random motion toward centre
● <b>Avoid:</b> Strength of neighbour avoidance instinct with nearby flockmate		<b>Dab</b> Light + Direct + Sudden	Calm, focused, soft, and quick lines or dots with radial motion inwards towards centre
● <b>Attract:</b> Strength of attraction to point of attraction		<b>Wring</b> Strong + Indirect + Sustained	Slow, focused, radial, and wavy lines or dots with radial or spiral motion toward outwards from centre
● <b>Align:</b> Alignment instinct with nearby Flockmates		<b>Float</b> Light + Indirect + Sustained	Calm, light, and linear lines or dots with a random motion toward upper right, left or centre
● <b>Prefdist:</b> Preferred distance from neighbours		<b>Slash</b> Strong + Indirect + Sudden	Fast, intense, spiraling, radial, and forceful lines or dots with linear or random motion outward upper right-left-up-down
● <b>Repel:</b> Strength of object avoidance instinct		<b>Flick</b> Light + Indirect + Sudden	Calm, light, spiraling, and radial, lines or dots with linear or radial motion outward upper back right or left
● <b>Dist:</b> Vision distance to avoid objects			
● <b>Speed:</b> Overall speed			
● <b>Internia:</b> Willingness to change speed and direction			
● <b>Max/Min:</b> Maximum or minimum speed of speed range			

Figure 2: The mapping from Boids computational parameters to the eight Basic-Efforts to create eight motion patterns

To generate visual representations of movement quality, the EMVIZ (flow) system uses a computational model of autonomous agents built with Max/Msp, called Boids (bird-like object). The Boids system simulates artificial agent motion behaviours (i.e., flocking behaviour) based on realistic representations of animal behaviour, such as flocks of birds, schools of fish or animal herds (Reynolds 1987). In the Boids system, every agent is capable of wandering around their world seeking a target at specific locations, steering to avoid other agents, steering towards the average heading of other agents, and steering towards the average position of other agents (Reynolds 1987). When agents interact with each other, the complexity of agent motion patterns emerges. These motion patterns can be computed based on a set of simple rules and the parameters of the simulated flocking agent can be optimized to create different types of motion patterns.

#### 4.2 Boids Computational Parameters and Motion Patterns Qualities

The computational parameters of Boids were mapped onto characteristics of each *Basic-Effort* in a way that is consistent with design principles of affective motion texture (Lockyer *et al.* 2011 & 2012). Through simple shapes, different movement types can convey meaning or emotion through their motion patterns. Fast, intense, dense, focused and straight forceful lines or dots with linear, radial or random motion toward the centre can represent a sense of drive with force. In contrast, calm, light, and linear lines or dots with a random motion toward upper right, left or centre can communicate a feeling of movement in a liquid environment or the air. Slow, focused, forceful, and straight lines or dots with linear motion outwards from the centre can represent a feeling of movement by weight or force in a certain direction. Slow, focused, radial, and wavy lines or dots with radial or spiral motion towards or outwards from the centre can communicate twisted or compressed movement. Thus, motion pattern can be metaphorically

mapped onto the domain of the human body in motion.

For instance, forceful, focused, and quick quality of Strong Weight, Direct Space, and Sudden Time can be represented by fast, intense, and focused lines or dots moving with linear, radial, or randomly moving patterns toward the centre. In contrast, calm, focused, and slow lines or dots moving with linear motion to upper right or left can convey Light Weight, Direct Space, and Sustained Time. We describe our interpretive mapping choices in Figure 2.

Our mapping design process was explored by experimenting with the adjustment of Boids computational parameter values. We divided each parameter into High, Medium, and Low values. Each parameter consists of defined sets of integer-number values between 0 and 90. High parameter values range between 61 and 90, Medium parameter values between 31 and 60, and Low parameter values between 1 and 30. Specific combinations of High, Medium, and Low values for each Boids computational parameter can create certain types of motion pattern. Figure 3 presents an example of a specific combination that creates a sense of drive with Force, Thrust or Punch *Basic-Effort* rule. This approach uses combinations of different High, Medium, and Low Boids computational parameter values to create eight *Basic-Efforts* design rules for generating visualisation of movement quality.

Punch Basic-Effort Rule					
Boids Computational Parameters					Value
<b>Max</b>	<b>Accel</b>	<b>Internia</b>	<b>Repel</b>	<b>Speed</b>	High (61-90)
<b>Attract</b>	<b>Neighbours</b>				Medium (31-60)
<b>Align</b>	<b>Match</b>	<b>Avoid</b>	<b>Dist</b>	<b>Prefdist</b>	Low (1-30)

Figure 3: Example of specific combination of Boids computational parameter values for Punch Rule

### 4.3 Colour Mapping

In mapping movement quality to colour, we encountered problems of subjectivity because no previous research explored the relationships between the perception of different movement qualities and colour psychology. However, some empirical research projects describe the relationships between emotion perception and human-body movement. For instance, some emotions were found in the whole body posture and its movement quality (Wallbott 1998, cited in Kipp *et al.* 2009). Distinct emotions are often associated with different qualities of body movement, such as the amplitude, speed, and fluidity of movement (Pollick *et al.* 2001). High movement activity or high speed, velocity, and acceleration of body movement can create a sense of excitement or arouse multiple emotions, while low movement dynamics can create a sense of sadness or low intensity (Atkinson *et al.* 2004). In colour psychology, the darker or more saturated a colour is, the more it connotes “forcefulness,” while the more hue a colour has, the more it connotes “calmness” (Wright & Rainwater 1962). Several researchers have suggested that colour can communicate an inner expression or emotion to the viewer (Picard 2000). Similarly, Laban proposes that movement quality is an indicator of inner physical attitude.

To effectively map between colour and human movement quality, we grounded our colour mapping on human movement quality, emotion perception, and the colour psychology theories described above. We combined them with our own subjective criteria to design a set of simple colour palettes for the eight *Basic-Efforts*.

We adopted Goethe’s primary colour circle (e.g., red, yellow, blue, green, purple, and orange) as a model for describing colour characteristics, associated with emotions (Goethe 2008) and characteristics of movement quality, and used them with our EMVIZ (flow) drawing parameters. Hue and colour value were assigned to each *Basic-Effort*, while saturation was mapped onto values taken from the stream of BEA vectors. For instance, high Punch value (i.e., Punch=1.0) creates high saturation of red, while low Punch value (i.e., Punch=0.5) creates lower saturation of red. Figure 4 presents an example of Punch values between 1.0 and 0.5. Figure 5 presents our subjective and expressive use of colour for the eight *Basic-Efforts*.



Figure 4: Example of Punch colour values between 1.0 and 0.5

Basic-Effort	Colour Palettes	Colour Characteristics Associated with Emotion	Motion Quality Characteristics
Press		Power, Nobility, Ambition, Stability, Active	Focus, Straight, Undeviating, Forceful, Leisurely, Lingering
Glide		Comfort, Calm, Faithful, Determination	Focus, Straight, Indulging in time, Easily overcoming gravity
Punch		Anger, Aggressive, Intense, Active	Forceful, Powerful, Fast, Focus, Straight
Dab		Excitement, Energy, Emotional	Focus, Straight, Undeviating, Weightless, Buoyant, Urgent
Wring		Calm, Powerful, Comfort	Forceful, Powerful, Flexible, Spiraling, Slow, Lingering
Float		Calm, Neutral, Peaceful	Buoyant, Wandering, Deviating, Slow, Lingering
Slash		Joy, Excited, Warmth, Dynamic, Energetic	Fast, Energetic, Active, Wandering, Deviating
Flick		Neutral, Excited, Comfortable	Weightless, Wandering, Deviating, Quick, Urgent

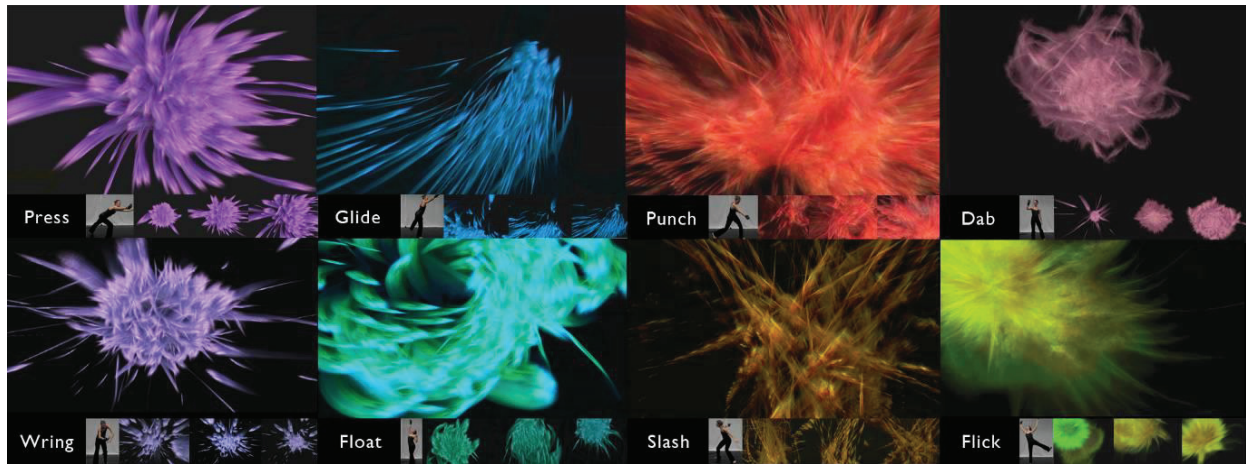
Figure 5: Colour Palettes for each Basic-Effort

## 5. EXPERIMENTS AND USAGE

In this section, we describe the study materials for examining EMVIZ (flow) application and its usage at an art exhibition and community event where we presented EMVIZ (flow) system.

To examine the EMVIZ (flow) system’s performance, we asked a dancer who has studied LMA as part of her university-level dance training to wear the hardware sensor glove (Figure 1a) and perform all eight Basic-Efforts. We videotaped the dancer’s performance and designed custom software for recording the BEA vectors stream generated by the glove’s sensor. Arm position data (X, Y, Z) was also recorded using the Microsoft Kinect tracking hardware system (Figure 1b). The dancer performed the eight Basic-Efforts-Actions in the following sequence: press, glide, punch, dab, wring, float, slash, and flick. The BEA vectors stream and associated arm position data were recorded in real-time. We recorded eight videos of the dancer’s performance, capturing BEA vectors streams and arm position data for 64 movement profiles, with eight stream profiles for each Basic-Effort. We examined Basic-Efforts movement profile streams and selected the best representative profile streams for each Basic-Effort. EMVIZ (flow) used these profile streams to generate eight visual representations of movement quality, presented in Figure 6.

EMVIZ (flow) application was used in Flow, an improvisational dance performance at the Emily Carr University of Art and Design in Vancouver, Canada during a CHI 2011 workshop on the theme of “the user in flux” (Figure 7a). During Flow, movement qualities were extracted from the performer’s body and the resulting visualisations projected onto the floor. At the end of the performance, we invited the audience to use a glove equipped with the EffortDetect hardware system to interact with EMVIZ (flow).



**Figure 6:** The eight Basic-Efforts or the eight visual representations of movement quality generated by EMVIZ (flow)



**Figure 7:** (a) Flow: Interactive Dance Performance at CHI 2011 workshop. (b) EMVIZ (flow) system at Simon Fraser University Open House 2011 event

EMVIZ (flow) was also exhibited at Simon Fraser University Surrey's Community Open House 2011. In this event, we again encouraged the audience to use the EffortDetect glove to interact with EMVIZ (flow) and move with various qualities while guided by the authors and a dancer describing the concept of movement qualities and LMA Effort (Figure 7b).

## 6. CONCLUSIONS AND FUTURE WORK

The EMVIZ (flow) visualisation represents our design exploration and mappings between movement qualities, and uses Laban Basic-Efforts, the autonomous flocking agents Boids system, human movement, and colour psychology. The visual representations of movement quality reflect our aesthetic choices that combine three domains of knowledge: artistic visualisation, LMA Effort, and artificial life. These choices were grounded in different theoretical frameworks for representing movement quality information in a visual domain. We described (1) the EMVIZ (flow) design process, (2) how we experimented with conceptual mapping by adjusting Boids computational parameter values to create eight design rules, and (3) how we chose an expressive use of colour for representing movement quality. We also described how EMVIZ (flow) was demonstrated in interactive dance performances, where attendees had the opportunity to experience visual representations of movement quality and interact with the system.

We are currently evaluating the EMVIZ (flow) system through an assessment of movement quality communication. In this evaluation, we record the ability of the visualisation to convey and represent movement quality information to the viewers. We aim to recruit domain experts—or a certified Laban Movement Analyst (L/CMA) who has completed the 500-hour training program in Laban Movement Studies—to participate in a survey to evaluate the EMVIZ (flow) system. We anticipate that the visual representations of movement quality generated by EMVIZ (flow) can communicate or convey movement quality information recognized by movement experts.

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