

## 1. Introduction: Cephalic annotation scheme

Within the framework of our corpus we adopt a formal and functional approach to define the boundaries in the whole repertoire of kinetic behavior (see Annotation of Manual Gestures). Cephalic annotation presupposes the description of this channel using principally similar notions and terminology as in the description of manual gestures: cephalic gestures, adaptors and cephalic posture changes. We also single out periods of stillness. However, there are some differences caused by the fact that we have one head (versus two hands) and its movements are very often triggered by other body parts.

The annotation process is based on the distinction between head movements and the periods of stillness that appear between these movements.

At the first and most basic level, movement chains and general kinetic units are annotated: these are Movements A, Movements B and Displacements.

**Movement chains** are periods of cephalic activity.

The FIRST MOVEMENT TIER (\*-**cMovementA**<sup>2</sup>) contains all head movements proper: the head moves around three axes and in three planes (see Fig. 2). These movements are discerned according to changes of their spatial and kinetic characteristics. Changes in velocity, amplitude and the intensity of a movement also prove that there is a new movement. Subsequently these movements would be potentially categorized as cephalic gestures and posture changes.

Cephalic gestures are considerably meaningful movements that are performed with a particular communicative aim. They are connected with speech and its perception (for example, nodding).

Posture changes are movements that aim to move the head from one neutral position to another that would differ in one of the axes, with a certain fixation in this position.

The SECOND MOVEMENT TIER (\*-**cMovementB**) contains all head movements proper: the head moves around three axes and in three planes (see Fig. 2). These movements are also discerned according to some changes of their spatial characteristics. Changes in velocity, amplitude and the intensity of a movement also prove that there is a new movement. However, there is a difference compared to the Movement A tier. The movement in the second tier is initiated in other kinetic channels (e.g., the manual channel or the torso channel). It is usually accompanied by other movements. A preliminary analysis can show that these movements are adaptors or echo movements.

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<sup>2</sup> Tier name in ELAN.

There are two main types of adaptors and two combined ones (cf.: manual adaptors). They are differentiated according to the following criteria: 1) there should be a kinetic prominence (the movement is visible, or there are some changes in the head position in space); 2) the movement is not connected to speech; and 3) there is a direct interrelation with other channels (manual, facial, etc.).

**Type 1 Adaptors** are physiologically induced movements. They are well-structured head movements proper. Those movements are concomitant with movements in other kinetic channels; for example, during a sneeze the head moves **Down** and the hand(s) moves **Up**.

**Type 2 Adaptors** are also physiologically induced head movements proper. They have a rhythmic structure and are also linked with movements in other kinetic channels (e.g., laughter). There can be combinations of those two types: Adaptor 1+2 and Adaptor 2+1.

**Echo movements** are head movements that are produced like an echo from the movement in another channel (a part of body other than the head).

The **THIRD TIER (\*-cDisplacement)** covers head displacements when there is no head movement proper but the head is displaced in space and time.

The next tier shows the stillness periods.

Cephalic postures are annotated as intervals from one neutral position (A) to the next one (B) that is not identical to the first one. If the head takes some posture (A) and then returns to it after a series of movements, it would be considered one cephalic posture. The period of movement between the last instance of posture (A) and the first instance of posture (B) is called a transition phase which refers to the current posture and is annotated separately.

Gesture chains and movement chains form the interim components of the scheme; gesture chains are continuous sequences of gestures, and movement chains are the intervals of continuous movements (from one stop to another).

Independent tiers of cephalic units of different levels are bound directly to the time axis. Dependent tiers are used for the classification of the object and indication of their features. Figure 1 below shows an annotation scheme created in ELAN. Tables of tiers, types of tiers, linked vocabularies (if any) and other codes are described in Section 3.

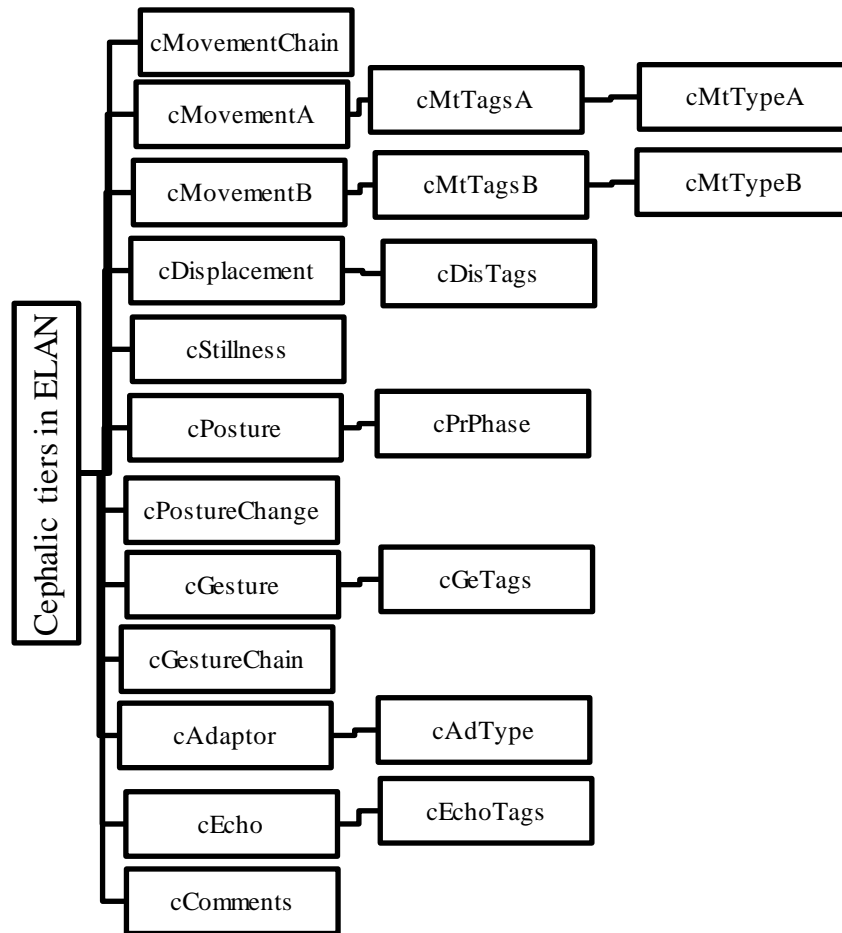


Fig. 1 Scheme of cephalic annotation in ELAN.

## 2. Annotation Procedure

The boundaries of cephalic movements are set if a certain range of characteristics varies. Any noticeable change in these properties at a certain point is viewed as a boundary between movements. The head can move along three axes and in three planes (see Fig. 2):

- 1) around the mediolateral axis (imaginary line *right ear-nose-left ear*) in a sagittal plane. For example, **TiltLeft** (*a*);
- 2) around the vertical axis (imaginary line *forehead-nose-chin*) in the horizontal plane. For example, a **nod** (*b*);
- 3) around the anteroposterior axis (imaginary line *nose-nape/back of the neck*) in the frontal plane. For example, **Backwards** (*c*).

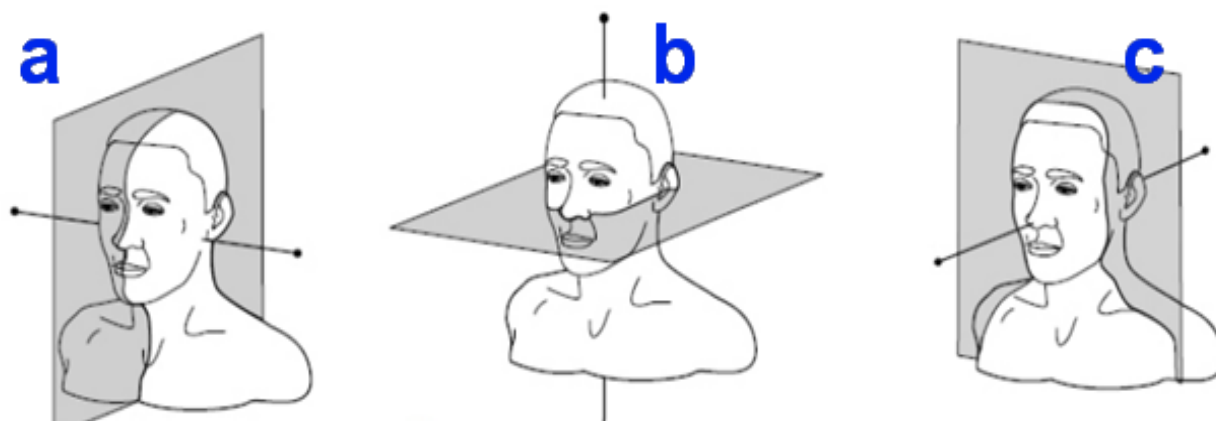


Figure 2. Head position in the three planes and its movements around three axes: **a** is a mediolateral axis and sagittal plane; **b** is a vertical axis and horizontal plane; **c** is an anteroposterior axis and frontal plane.

In most cases, changes in head position suffice to single out a movement according to its formal characteristics (see Fig. 2, Tables 1 and 2): a *single movement*. An example is the tag **TurnRight**. However, there are certain cases when the boundaries are not so easily established: we can see two movements. If there are two simultaneous movements, and it is very difficult to separate them and neither of them prevails, both being important, they constitute a *simultaneous movement*. For example, the tag **Down+TiltRight** means the person lowers his head down and at the same time tilts it to the right.

Note: ideally, a *simultaneous* movement consists of only two cephalic movements.

The kinetic characteristics of a movement are described in Table 1.

<i>Movement characteristics</i>	<b>Meanings</b>
<b>Amplitude</b>	wide / narrow
<b>Intensity</b>	strong / weak
<b>Velocity</b>	fast / slow
<b>Trajectory</b>	left / right / up / down
<b>Direction</b>	around three axes and in three planes

Table 1. Kinetic characteristics of a movement.



Figure 3. Cephalic movement **TiltRight**.

### 3. Formal Description of Cephalic Movements: Tagging

Head movements are given meanings that describe their physical characteristics.

It is necessary to choose a meaning from the list of tags given below (see Table 2). Tags describe the movements which we can observe following their physical characteristics. For example, a *single* movement upwards (**Up**); or a *simultaneous* movement upwards and to the left (**Up+TurnLeft**).

Meaning	Description
<b>Down</b>	Downward head movement
<b>Up</b>	Upward head movement
<b>Forward</b>	Movement of the head forwards
<b>Backward</b>	Movement of the head backwards
<b>TiltRight</b>	Movement of the head leaning on the right side
<b>TiltLeft</b>	Movement of the head leaning on the left side
<b>TurnRight</b>	Movement of the head turning on the right side
<b>TurnLeft</b>	Movement of the head turning on the left side
<b>Straighten</b>	Head is straightened
<b>Slide</b>	Displacement of the head from side to side
<b>Rock</b>	Head leans from side to side in a single continuous movement
<b>Rotation</b>	Head makes a circular movement; this need not be a complete circle, it may be a part of an arc
<b>Other</b>	It is difficult to describe the position

Table 2. Tags of the head movements.

#### 4. Type codes and rules for selection and annotation of cephalic movements

Table 3 shows a description of ELAN tiers used for the annotation of cephalic gestures, their types and characteristics, as well as the ways to fill out the table. Instead of \* in the number, one writes down the code of the speaker such as N for Narrator, C for Commentator or R for Reteller.

Tier	Parent tier	Tier Type	Vocabulary	Unit Code	Possible values	Comments
<i>First level of segmentation</i>						
*-cMovementChain	—	cMovementChain	—	*-cMtCn001	Unit code number	
*-cMovementA	—	cMovementA	—	*-cMtA001	Unit code number	
*-cMtTagsA	cMovementA	cMtTags	—	—	One or two values from the closed list	Mandatory field
*-cMtTypeA	cMovementA	cMtTypeA	—	—	One value from the closed list	Mandatory field
*-cMovementB	—	cMovementB	—	*-cMtB001	Unit code number	
*-cMtTagsB	cMovementB	cMtTags	—	—	One or two values from the closed list	Mandatory field
*-cMtTypeB	cMovementB	cMtTypeB	—	—	One value from the closed list	Mandatory field
*-cDisplacement	—	cDisplacement	—	*-cDis001	Unit code number	
*-cDisTags	cDisplacement	cDisTags	—	—	One or two values from the closed list	Mandatory field
*-cStillness	—	cStillness	—	*-cSt001	Unit code number	
<i>Second level of segmentation</i>						
*-cPosture	—	cPosture	—	*-cPr001	Unit code number	
*-cPrPhase	cPosture	cPrPhase	cPrPhase-cv	—	The only pre-defined value	Mandatory field
*-cPostureChange	—	cPostureChange	—	*-cPrC001	Unit code number	
*-cGesture	—	cGesture	—	*-cGe001	Unit code number	
*-cGeTags	cGesture	cGeTags	—	—	One value from the closed list	Mandatory field
*-cGestureChain	—	cGestureChain	—	*-cGeCn001	Unit code number	
*-cAdaptor	—	cAdaptor	—	*-cAd001	Unit code number	
*-cAdType	cAdaptor	cAdType	cAdType-cv	—	One value from the closed list	Mandatory field
*-cEcho	—	cEcho	—	*-cE001	Unit code number	
*-cEchoTags	cEcho	cEchoTags	—	—	One or two values from the closed list	Mandatory field
<i>Supplementary tier</i>						
*-cComments	—	cComment	—	—	Comments in free form	

Table 3. ELAN tiers for cephalic annotation