Cranium skeleton can be described as an armillar assembling of three flat hoops placed in sagital, coronal and transversal planes. Two hoops are complete: one *sagital* and one *coronal*. The transversal one, is incomplete at its frontal end (see Figure 1a).

The coronal hoop is pivoting on a supporting hoop through two joints: “atlas joints”. The sagital hoop is orthogonally fastened to the coronal and tthis to the transverse one. This is attached to the coronal hoop just below the atlas joints and attached to the sagital hoop at the same horizontal level.

Equivalent to the occipital bone is the region of the lower half of the coronal hoop, the lower half of the sagital hoop and the rear part of the transverse hoop.

There is a Supporting hoop, a true arc, fixed to a mobile plate in a pedestal. The arch stands in the mobile plate through two straight regions called atlas pillars. At the *‘capital’* of each atlas pillar a hole has been practiced to introduce the axis of a servomotor fastened in the pillar itself. The mobile plate performs rotational movements and correspondingly the whole head scanning movements. The tilting movemets of the head are due to the mentioned coronal pivoting.

The mobile plate is rotated by a servomotor placed inside a pedestal and by another servomotor at the top of an Auxiliary S shaped support. This Support is fastened to the pedestal and is also fastened to the Supporting Hoof in its upper most region.

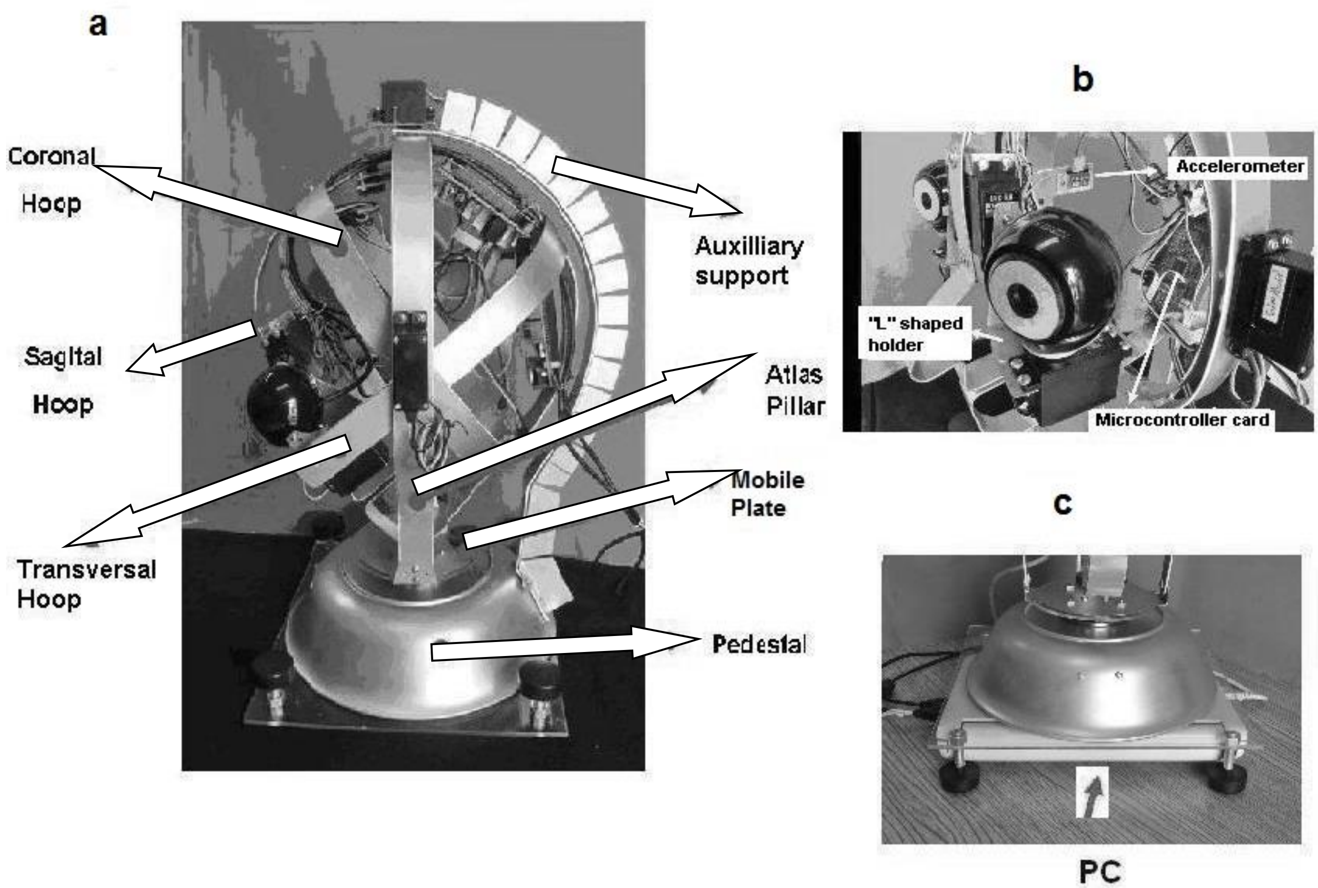

Figure 1a. Disposition of hoops and supports in **Cranium**. Figure 1b. Details with: "L" shaped eyeball-holders; microcontroller card and accelerometer. Figure 1c. The **PC** in place.

Cranium pedestal is an inverted plastic bowl. The bowl is mounted in an acrylic sheet with four leveling screws. The movile plate is actually a circular plate inside the cup of a 10 cm diameter ball bearing throug its lower cup, this cup attached to the pedestal (the ball bearing is not shown in Figure 1a).

The sagital hoop, in its frontal region has been shaped as a face profile (see figure 1b). Fastened to the internal side of the nasal part of the profile two back-to-back servo motors have being fastened. Each servo's axis carries an "L" shaped holder. Each "L" holder supports a servo that scans a globular Webcam. The tilting rotation of each of the cameras is achived by the rotation of their "L" holder (see figure 1b).

Dimensions and weight

Cranium has a length of 22 cm., a breath of 20 cm., an inter atlas-pilars joint distance of 12 cm. and a weight of 3.0 kg [4]. The eyeball cameras have a diameter of 5 cm. and o are 10 cm separated from one another.

Motor and sensor's topology

Figure 1A shows the *Craneum* skeleton and the location of the servomotors. The shafts and their motors for the two eyeball webcams are in place in their "L" shaped holders (see figure 1B for details). Each camera carries, inside, beside the light sensor an incorporated microphone.
One accelerometer (LSM303DLHC Pololu) has been attached to the internal side of the 'temporal' region of the coronal hoop, near the coronal-atlas pillars axis (2 cm. above). Figure 1b. The microcontroller card **Arduino** Mega

12890 can be seen in Figure 1b). Figure 1c shows, in a separated view that below the pedestal there is **PC** (Acer Aspire I; Intel processor Atom 1.6 GHz; OS Ubuntu 12.04) that is another part of the hardware of the head.

The two previously mentioned eye-ball camera virtual axes are approximately concurrent to the center of the Webcam sensor surface.

Cranium has 8 servomotors (Hitec), and 6 DOF. Two DOF for each of the two globular webcams one DOF for the Coronal hoop, and one for the Supporing hoop.

Computing devices' topology

A microcontroller card is fastened to the inner face of the Sagital hoop (Figure 1b) and an Acer notebook **PC** is placed below the pedestal (Figure 1c).