

2017 JCEG IX Meeting Summary

Wednesday

(Notes provided by [Carla Evans](#))

Ken Gladstone demo/Dolphin

- How to merge study models with CBCT? Both are 1:1 – no need to scale. Do each arch separately.
 1. Side by side superimposition. Pick three points on CBCT maxillary teeth. Pick same points on scan. Superimpose now button.
 2. Can put radiopaque markers on teeth before CBCT and scanning. Then do same.
 3. Look at translucency feature and do freehand superimposition. Or can do keyboard or type in numbers to rotate.
 4. Can do autosuperimpose.
 5. Crop away cone-beam teeth.
 6. Make scanned arches different colors.
- Discussion of how to do averaging of 30 13 year old male CBCTs?
- 3D Averaging of CBCT data requires setting air to a big negative Hounsfield number (e.g., -3000).
- Lea Bouserhal demonstration of her problems with averaging. Ken Gladstone gave suggestions.

AAOF Legacy Collection CURATORS MEETING

Report from Sean Curry

- Funding ends this year 3 for stage 3, application submitted to AAOF
- Not adding more images, all have been processed and loaded.
- 752 subjects (10 from Forsyth), 16000 images
- Bulk between 6 and 14 years of age
- Website located on Amazon web services in the cloud (between \$200 and \$300 per month)
- Three backups – Amazon, hard drive, another copy is off-site.
- Explanation of fiducial layouts and coordinates. Document is sent out with answers to requests. Sean Curry will send document to all curators. The names of fiducial points are SB1 (bottom left), SB2 (upper left), SB3, (upper right), SB4 (lower right), clockwise.
- Image requests were down slightly during the past year. Over the past 5 years, 20259 users.
- Ongoing support requested for five more years \$50,000/year. Preserve existing collection as a library, software upgrades, Storage and maintenance costs, answering requests. No expansion, no 3D study casts to be uploaded.
- 2015 - DE024722, 5 year R01 grant awarded (Michigan, Case Western, Fels, UOP) for facial prediction study.
- All curators should look at the webpage and submit any updates!

Business meeting for curators

- As long as funding lasts, no charge for using images.
- Discussion about having the AAO Librarian manage the library of images.
- Discussion about limiting the number of high resolution images that can be requested. Each collection can vet requests as they see fit. Burlington wants to see the protocols.
- Discussion about adding watermark to all images. Discussed cryptography. Leave up to curators, not a legacy project.
- Should there be a standardized database searching method for all the individual collections (use same as website)? That way someone could do a centralized search and find a specific set of images at the individual sites. Use the CRIL search function everywhere? What is used at CRIL? So each collection would export the data and then it would be uploaded on the CRIL website.
- Discussion of charging a user fee at individual sites. Case charges \$10 per image if obtained on site, capped at \$600. If have to send the image then \$64 an image. Fels just recovers staff time – all work must be done at Center, no images distributed.
- Suggestion – put links to other collections on website, e.g. Tweed, Bioprogressive, Cleft cases
- Possible meeting at AAO San Diego about putting together another funding proposal, to be organized by Mark Hans and Jim McNamara.

Thursday

The Blockchain and the Universally Global Electronic Health Record - Toni Magni

- Application of blockchain technology
- Who owns the patient's data? Patient data is heritage of humanity.

- Client-server model has central service that provides services – not possible, who will control?
- Peer-to-peer network, every node is the same (equipotency), same software, both a consumer and a producer of resources. Example: bitTorrent. Each participant is also a server; more participants means faster processing
- Blockchain v1: Bitcoin. Decentralized digital currency with the ledger on the peer-to-peer network. 1. Verification of identity, can't rewrite ledger, incentivize people to work on the ledger. Two keys for identity (one to lock/encrypt and the other/decrypt to unlock) by asymmetric encryption. No problem if the public key is intercepted. The private key must never be distributed by the owner.
- Hashing algorithms (used to secure the ledger). The hash is always the same length no matter how long the message is. Easy to create the hash, but can't go back easily.
- For ledger security, have sequence of blocks. Each block is composed of the hash of the previous one + the new transactions + a "nonce". The nonce is selected s.t. the resulting hash will start with some zeros. The only way to find that nonce is by trial and error, so it takes lot's of time to find the nonce, but little time for the rest of the peers to validate it. People are interested in investing computer resources to do these computations, because for each new block new money can be generated and assigned to whoever is the first to guess the "nonce". Transaction fees are also possible.
- Bitcoin for Medicine: the Blockchain
- Open source system, transactions could contain "links" to actual data, system runs in background. No need to have central database. Network verifies validity and permissions before attaching to blockchain.
- Microsoft, IBM, Smartrac RFFID, Factom

Leah Bouserhal – Part II

- Dolphin 3D version 11.9
- Slicer 4.5.0-1
- FMRIB v5.(Magnetic Resonance Imaging of the Brain)
- Smart Ceph (Edge Imaging, Ortho2, Ames, Iowa)
- Registered on bilateral frontozygomatic suture and left mental foramen by visual best-fit with subject #1 (the index patient) using Dolphin.
- Using 3D Slicer, remove the halo right at the edge of the skull produced by the FMRIB software. Seen on each individual scan. Rigid transformation of size (but not proportions) to be as close as possible.
- Ken Gladstone showed table of Hounsfield units from Wikipedia. Air -1000, water 0. CBCTs aren't calibrated. but more dense is more positive. Discussion started by Manuel (Alberta) = Hounsfield values change hour to hour, time of day. Discussion re voxel shapes: ICAT soupcans, Hitachi, spheres.

Ken Gladstone demo on Dolphin features in version 11.8

- Superimposition method
- Trace best radiograph. Then second radiograph, set ruler, locate two landmarks. Turn on overlay tracing. Then transfer all points.
- Demo by Moe. 3D superimposition. Bring up first CBCT image. Set orientation of volume with landmarks (may drag them) and point of origin (0,0,0,0). Bottom left use superimpose button. Choose another timepoint. Make sure different colors (base volume and second volume). Bring two images close together. Show middle slices and align them to reduce computational time. Select subregion: anterior cranial base (red superimposition voxels box), superimpose now. Easier to see because different colors. Can move around if you go back to overlay superimpose. Can do measurements – use measurement button to get distance. Use export button (lower left copy to clipboard button) to transfer to notepad or excel. Ken will check on how to get x, y, z coordinates.
- Can save the two conebeams as one color and then superimpose a third. Alternatively, save surfaces in different colors and then the colors will save.
- To do mandible, superimpose on just the mandibular symphysis and then rotate to fit molar and nerve canal. But whole volume is saved not just segmented mandibles. Looked also at maxillary superimposition (maxilla superior resorption).
- Talked about 3D goggles and 3D mouse to see things happen in 3D, especially treatment effects.

Carla Evans - Odontology and Facial Identification

23 and me, Prometheus (to upload 23 and me data for \$5) websites.

Friday

SUMMARY

I. Superimposition

- Cranial Base superimposition in Dolphin in adults is JCEG Approved Here are some of the parameters that need to be included.
- Notes: Polygon should include different structures based on patient's age. Based on the degree of fusion of cranial base synchondroses. In the sagittal plane the body of the sphenoid bone can always be included but not sella, The occipital bone should never be included when the sphenoccipital synchondrosis is patent on the T1 image. Portions of the ethmoid bone can be Included with the body of the sphenoid bone after approximately age 7.
- Regional superimposition is more problematic depending on the reference planes used and maxilla is more consistent than mandible due to the fact that the maxilla has the palate to use as a reference.
- When patient's head is not positioned in same place in both volumes, look for continuity of bones not expected to change in superimposition.
- For mandibular superimposition. Do rough superimposition on two gonions and menton first. Then do regional boxes and do "superimposition now." Software needs to be able to show canals. Third molar should not move. Can look at half mandibles for dental changes. Can set the crosshairs to check between images. Helps to make slices as thick as possible.

II. 3D Morphologic Standards

- Two methods should be explored
- Voxel based as shown by Bouserhal
- Surface based using landmark data and morphometric techniques as described by Bookstein

III. Intra-Oral Scanning

Everyone has two Itero's

IV. 3D Printing

Still costly

V. Face Scanning

- Cost now around 1K and can be merged with CBCT Fuel produces industry standard OBJ file.
- Cell phone apps very promising for three D
- Dental-Monitoring very promising for research and patient care

VI. Database of 3D CT images

VII. Emerging Technologies-

- Block Chain-Best example of implementation is BitCoin
- Ethereum and IPFS offers possibilities that could be adapted for medical records.
- Newest form of distributed computing and could be used for electronic health records.
- Orthoscience.com online databases of treated cases, coming late in 2017.

File **Modified**

No files shared here yet.