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Quantitative movement analysis requires kinematic measurements. Whatever the means used to acquire data, these last contain a certain amount of error. When the evaluation of velocities and accelerations is involved in the analysis, the noise is amplified to such an extent that further signal processing is required.

A simple example of noise magnification caused by differentiation is given assuming that the measurements contain an additive sinusoidal term \( A \cdot \text{sen}(2\pi ft) \) with a very small amplitude \( A \) and a very large frequency \( f \). In this case the influence on the raw data is of no importance but, considering the velocity and the acceleration obtained from these, it is evident that the weight of the differentiated error terms, respectively \( 2\pi f A \cdot \cos(2\pi ft) \) and \(-2(2\pi f)^2 A \cdot \text{sen}(2\pi ft)\), is very strong or even larger than the useful signal.

Many algorithms have been proposed for data smoothing, but only few of them are suitable to obtain a reliable derivatives assessment. An exhaustive review on this argument can be found in WOOD (1982) and WOLTRING (1985). Among these procedures, the more interesting are those able to determine automatically the optimal parameters of the filter for noise reduction, by using information about the signal itself (ANDERSSEN and BLOOMFIELD (1974), WOOD and JENNINGS (1978), CRAVEN and WAHBA (1979), GASSER (1986, WOLTRING (1986), D'AMICO and FERRIGNO (1988)).

The peculiarities of these methods are the speed (they do not require operator interaction) and the homogeneity of the results, being the smoothing amount automatically set and not left to the operator's decisions.

Although the smoothing procedures act very well for the noise reduction, the investigator must keep in mind that, given the accuracy of a certain data acquisition instrumentation, the sampling rate plays a fundamental role in the computation of accurate derivatives of first and second order. LANSHAMMER (1982) reported in fact an error formula which mathematically shows this relationship.

The noise coloration too degrades the performances of the cited algorithms because almost all of them hypothesize that a white uncorrelated zero mean noise is added to the useful signal. A particular care must be taken in procedures like calibration for stereophotogrammetry which contributes to noise shaping. Another cause of performance degradation to be kept into account when setting up the experiments is the landmark positioning on the body, which, in presence of soft tissues, can generate medium frequency oscillations seen as useful signal which can noticeably disturb the second order derivatives.

In summary, a good algorithm for data smoothing is important, but it can act well only if some constraints on data acquisition are met.

*Editor's note: The complete Bibliography can be obtained from the Authors.*
BIOMCH-L

An Electronic Mail Discussion List for Biomechanics and Human Movement Science

By: Herman J. Woltring
EINDHOVEN
The Netherlands

An electronic distribution list has been created for members of the International Society of Biomechanics (ISB) and of related organizations (e.g., European, American and Canadian Societies of Biomechanics) which, at least for users of EARN/BITNET/NETNORTH systems, allows free exchange of information with fellow-members on the list. In view of the overlap between Biomechanics and other fields such as Kinesiology, Bioengineering, Motor Control, and Physiology, the list is also open to non-members. At the time of writing (November 1988), there are about 30 known subscribers in Belgium, Canada, Finland, France, Ireland, Israel, Netherlands, United Kingdom, and the United States, plus an unknown number of readers on Usenet, the new posting system for UUCP (Unix-to-Unix CoPy).

Activities on the list include discussions, congress reports, calls for help, calls for papers, and anything else relevant to the target domain. It is considered correct procedure that summaries of replies received in response to "calls for help" are posted for the benefit of all readers.

Users on EARN/BITNET/NETNORTH may subscribe to the list by electronic mail or by sending one of the following interactive commands (or the equivalent command for their system):

VAX with VMS : SEND LISTSERV AT HEARN SUB BIOMCH-L <name>
VM/SP : TELL LISTSERV AT HEARN SUB BIOMCH-L <name>
MVS with TSO/E : TRANSMIT HEARN.LISTSERV NOPROLOG

and enter SUB BIOMCH-L <name><PF3> on the screen where <name> should be the user's full name (e.g., initials and last name).

When sending the request interactively, it might be advisable to place <name> within double quotes, as in "<name>", since some systems will otherwise convert the text into capitals only.

Messages can be submitted for distribution over the list by sending the message in mail format to BIOMCH-L AT HEARN (but NOT to LISTSERV AT HEARN!). At present, the list is open for subscription and distribution without editorial interference. Note that EARN/BITNET/NETNORTH imposes certain standards as regards non-academic use; see the relevant information which can be obtained from NETSERV AT HEARN or from any other NETSERV file-server on EARN/BITNET/NETNORTH. In order to protect the subscriber's privacy, their names and electronic addresses cannot be REVIEWed (even though subscription is open to anyone); depending on subscriber's wishes, this policy might be reconsidered. At present, the list exists merely at the central EARN-node in The Netherlands (HEARN at th University of Nijmegen). Depending on the list usage, so-called "peer servers" may be created in other countries so as to reduce long-distance electronic mail expenses. In addition, this would allow use of the option for "local" distribution from one server (e.g., nation-wide) or for "global" distribution from all servers simultaneously.
To some extent, non-EARN/BITNET/NETNORTH users may communicate via electronic mail messages (but not interactively as in the above examples). If this fails, I shall be happy to enter their electronic addresses in the BIOMCH-L distribution list. Note that use of the facility on other networks (e.g. ARPA/Internet, JANET, UUCP/Eunet) may entail expenses which are charged to the user.

Readers not familiar with electronic mail and it's facilities should refer to their local computer centre, or read the paper "Notable Computer Networks" by Quarterman & Hoskins in the Communications of the ACM, October 1986.

The Author can be contacted through:

EARN/BITNET/NETNORTH: wwtmhjw AT heitue5, wwtmhjw AT heitue51
ARPA/Internet: na.woltring AT na-net.stanford.edu

++news++news++news++news++news++news++

HESTA - the newly formed association of Health and Exercise Technologists Association has presented the first issue of it's magazine "Motion Technology". It contains news and solutions for technicians and associated people within the health and exercise science field.
The topics discussed in the first edition include:
- The Watchless "Sports Tester"
- Preliminary Report on a Dynamic Calibration Rig for Ascertaining the Accuracy of Ergometers in Health and Exercise Science.
- Strain Gauge Installation.
- Sensors: Thermocouples, Humidity, Piezoelectric, Pressure and Force.
- High Resolution Display Watt Meter.
Furthermore there is information on product suppliers and equipment for sale. Anyone interested in supplying information or obtaining copies of the HESTA magazine is asked to contact:

Martyn Smith
Australian Institute of Sport
PO Box 176
Belconnen
Australian Capital Territory
Australia 2616

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Change of address: Hashem Kilani has completed his PhD degree and is now an Assistant Professor at the University of Jordan, Faculty of Physical Education, AMMAN, Jordan.

++news++news++news++news++news++news++
USTA announces research grants available:
To help individuals currently involved in or interested in
pursuing tennis research, the United States Tennis Association is
pleased to announce the availability of Research Grants. The
purpose of the grants, according to Paul Roetert, Coordinator of
Research and Head of the grant program, is to encourage people
who are independently, or in conjunction with academic insti-
tutions, exploring information related to teaching or playing of
tennis. The primary interest is in original research that will
benefit both tennis players and tennis public at large.
For 1989, the USTA has set aside 10,000 $ in grant money. In most
cases, awards will range from $250 to $750. During 1988, 22
grants were awarded, covering topics relating to the psychologi-
cal as well as physical aspects of tennis. The results can be
presented in the form of a report, Thesis paper or project
summary. Information gained from these efforts will be widely
disseminated by the USTA to all tennis players and coaches to
contribute to the enhancement of the game.
Interested individuals should contact Jill Salayi, USTA, 707
Alexander Rd., PRINCETON, NJ 08540 immediately.

REVIEW OF

Current Research in
Sports Biomechanics

B. Van Gheluwe and J. Atha (Ed.). Medicine and Sport Science,
Vol. 25, M. Hebbelinck, R.J. Shephard, Editors.

To researchers in the biomechanics of sports area, this book is
an excellent resource for the most current topics and up-to-date
information. Generally the book is well-written, easy to under-
stand, and includes a summary of the latest important topics of
research in sports biomechanics. There are clearly a number of
articles in which the authors used the power and energy approach
in analyzing movement. This is information that does not usually
appear in other publications. Theoretical and physical modeling
is presented. Gymnastics and high jumping are the specific
sports addressed. The reader should utilize the concepts of high
jumping and gymnastics to apply to other sports.

The first article, authored by SHORTEN, consists of a review of
muscle elasticity and performance. Applications to sports
movements must be inferred.

DAPENA then presents an overview of research on high jumping.
Although much of this has been recorded previously, it is an
easy-to-read article. Readers should achieve a better understand-
ing of the mechanisms involved in high jumping and the elements
which are determinants of success.
WINTER proposes that biomechanists are fortunate in being able to analyze energy patterns at individual joints and individual segments in order to quantify the net effect of neural control and metabolic systems. The conclusion, however, is that the total energy calculated is limited by the mechanical model which assumes certain inanimate characteristics.

LAKOMY presents a precise measurement of human power output and challenges us to do more with the measurement of human power.

WOODS presents a brief but comprehensive paper on sprint running. He uses a modified Hay and Reid schema, plotting the stride frequency and stride rate, and the ground reaction forces. He concludes that the leg recovery is the ultimate limiting factor here in sprinting success (or fatigue) and primarily this is due to eccentric conditioning level of the hamstring muscle.

LUETHI and STACOFF present foot mechanics and the influence of the shoe on different ground surfaces, especially asphalt. Since asphalt cannot be avoided by distance runners, the shoe factor is the easiest to change. The engineering of shoes, shoe inserts, and effect of shoes on kinematics and kinetics of running are summarized.

YEADON presents an excellent review of descriptive, experimental, and theoretical modeling. He completes his paper with a description of a computer simulation model with 14 orientation angles of the segments and frames of reference defined as somersaults, tilt and twists. Applications to coaching were presented with respect to diving.

BAUER takes a different approach, and that is to build the physical model and then simulate the sports performance. An excellent review of physical models, primarily those published by European researchers, is presented. Static and dynamic models are described and one model, a mechanical gymnast operating from a high bar as a two-link model, can actually be built using the information Bauer presents.

BRÜGGEWANN discussed the theory of categorizing gymnastics movements into three schema. He also describes research linking technical skill and mechanical loading on bones, muscles, tendons and ligaments. During landings, 16 times body weight has been calculated and the Achilles tendon is estimated to experience 110 N² in stress.

VAN LEEMPUTTE and WILLEMS present a short literature review and then describe a new method of quantification: filtered, differenced and transformed EMG (FDT/EMG). The FDT/EMG was found to be superior to the IEMG method. The authors applied FDT/EMG to the analysis of flexion at the elbow. They found muscle activity changed during flexion: e.g. at 175 degrees approximately 91% for brachialis, and 60% for biceps brachii and brachioradialis. The revers was noted when the forearm was flexed to 75 degrees.

Review by:
Dr. Marlene Adrian, University of Illinois at Urbana-Champaign
ISBS LOGO CONTEST

As announced in the previous newsletter, the logos submitted are presented on the following pages. Each ISBS member is asked to take a vote on the design to be chosen as the official ISBS logo.

A

INTERNATIONAL SOCIETY FOR BIOMECHANICS IN SPORTS

B

ISBS

International Society of Biomechanics in Sports

C

D
PROCEDURE:

Each Logo design has a number. You have 10 points which you can give to a single logo or split up between several logos. Thus, if you think that logo X is the best but logo Y has some merit you may want to allocate 7 points for X and 3 points for Y. If you wish to make additional comments, please feel free to do so. Deadline is September 1st, 1989. Please send your ballot to:

Dr. Hans J. Gros
Institut fuer Sportwissenschaft
Allmandring 28
7000 STUTTGART 80

FAX: 0711 685-3500
"STRIDE INTO THE 1990's - WITH SPORT TECHNOLOGY AND TECHNIQUE"

REGISTRATION FORM

NAME__________________________________________ FEMALE__ MALE__
SURNAME FIRST NAME

INSTITUTE/COMPANY_____________________________________

ADDRESS______________________________________________

CITY____________________ STATE/PROV._______ ZIP CODE_____
COUNTRY_______________________________________________

MODE OF TRAVEL: CAR__ BUS__ TRAIN__ AIR__

ARRIVAL DATE:_______ TIME:____ AM/PM AIRLINE_______ FLIGHT____

DEPARTURE DATE:_______ TIME:____ AM/PM AIRLINE_______ FLIGHT____

A. REGISTRATION (including proceedings, receptions, and socials)

<table>
<thead>
<tr>
<th></th>
<th>MEMBER</th>
<th>NON MEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Full week participant</td>
<td>$250</td>
<td>$275</td>
</tr>
<tr>
<td>2. Three day participant</td>
<td>$150</td>
<td>$180</td>
</tr>
<tr>
<td>3. One day participant</td>
<td>$50</td>
<td>$60</td>
</tr>
</tbody>
</table>

(deduct 10% if registration is submitted before June 1st, 1989)
(student concession 50% deduction from registration)
B. OPTIONAL SOCIALS - dinner and entertainment

1. Tuesday, July 4th - Kelly
   Brook Winery and Australian
   Bush (70 positions available) .........$35 x ____ No. = ________

2. Wednesday, July 5th - Ricketts
   Sanctuary and Sky Top
   (60 positions available) ............$40 x ____ No. = ________

These special events will be on a first come first serve basis
due to limited space.

C. ACCOMODATION VENUES:

1. Footscray Motor Inn $70 $78 $78 $8 x ____ days=______
2. Mid-Gate Motor Lodge $44 $49 $51 $12 x ____ days=______
3. F.I.T. Housing $35 (inc. 2 meals/day) x ____ days=______

If double or twin accomodation is desired please indicate room
mate:__________________________________________

D. MEMBERSHIP FEE:

1. Professional - $20/year x ____ years (max. of 3) = ________
2. Student - $5/year x ____ years (max. of 3) = ________

E. FULL PAYMENT ENCLOSED____________________ TOTAL ________

F. FULL PAYMENT SHOULD ACCOMPANY YOUR REGISTRATION FORM.
   All cheques must be made in Australian dollars or via an
   international money order made payable to "ISBS-FIT SYMPOSIUM
   TRUST A/C".

RETURN THIS FORM WITH PAYMENT BEFORE JUNE 1ST 1989 TO:

F.I.T.  I.S.B.S.
Department of Physical Education and Recreation
Footscray Institute of Technology
P.O. Box 64
FOOTSCRAY 3011
AUSTRALIA
Dr. H. J. Gros
JfS, Keplerstrasse 17
Universität Stuttgart
D 7000 Stuttgart 1
W. Germany

Dr. Kathy Barthels
Department of Physical Education
and Recreation Administration
California Polytechnic State University
San Luis Obispo, California 93407
USA

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