

XXII ISPRS Congress 2012

Technical Commission V

ISPRS Archives Volume XXXIX – B5, 2012

Melbourne, Australia

25 August - 1 September 2012

Editors:

M. Shortis

J. Mills

ISBN: 978-1-62993-516-4

DETERMINING THE TECHNICAL STANDARDS OF PING PONG TABLE BY USING CLOSE RANGE PHOTOGRAMMETRY

U. Acar, B. Bayram, H. I. Cetin, and F. B. Sanlı

Page(s) 1-4

DETERMINING PULL – OUT DEFORMATIONS OF BONDED METAL ANCHORS EMBEDDED IN CONCRETE BY MEANS OF PHOTOGRAMMETRY

E. O. Avsar, M. O. Altan, U. A. Dogan, and D. Akca

Page(s) 5-8

MONTE-CARLO- SIMULATION FOR ACCURACY ASSESSMENT OF A SINGLE CAMERA NAVIGATION SYSTEM

F. Bethmann and T. Luhmann

Page(s) 9-14

IMPLEMENTATION OF ZOOM-DEPENDENT CAMERA CALIBRATION IN CLOSE-RANGE PHOTOGRAMMETRY

C. S. Fraser, S. Cronk, and C. Stamatopoulos

Page(s) 15-19

IPS – A SYSTEM FOR REAL-TIME NAVIGATION AND 3D MODELING

D. Griebbach, D. Baumbach, A. Börner, M. Buder, I. Ernst, E. Funk, J. Wohlfeil, and S. Zuev

Page(s) 21-26

DEVELOPMENT OF A WIND OBSERVATION SYSTEM USING PHOTOGRAMMETRY

H. Kawasaki, T. Koizumi, and K. Matsuda

Page(s) 27-31

USING VISION METROLOGY SYSTEM FOR QUALITY CONTROL IN AUTOMOTIVE INDUSTRIES

N. Mostofi, F. Samadzadegan, Sh. Roohy, and M. Nozari

Page(s) 33-37

DETERMINATION OF THE DEGREE OF GRAVEL AGGREGATE-BITUMENCOVERAGE BY MULTI-DIRECTIONAL REFLECTANCE MEASUREMENTS

C. Mulsow

Page(s) 39-43

AUTOMATIC CALIBRATION OF STEREO-CAMERAS USING ORDINARY CHESS-BOARD PATTERNS

A. Prokos, I. Kalisperakis, E. Petsa, and G. Karras

Page(s) 45-49

IMPLEMENTATION AND EVALUATION OF A MOBILE MAPPING SYSTEM BASED ON INTEGRATED RANGE AND INTENSITY IMAGES FOR TRAFFIC SIGNS LOCALIZATION

M. Shahbazi, M. Sattari, S. Homayouni, and M. Saadatesresht

Page(s) 51-56

EFFICIENT EXTRACTION METHOD OF THE CHANGE OF BUILDINGS FOR FIXED PROPERTY INVESTIGATION

Y. Tanauchi and H. Chikatsu

Page(s) 57-62

REAL TIME DATA PROCESSING FOR OPTICAL REMOTE SENSING PAYLOADS

J. Wohlfeil, A. Börner, M. Buder, I. Ernst, D. Krutz, and R. Reulke

Page(s) 63-68

CONSTRUCTION OF A SYSTEM FOR DEFINING AREAS WHICH ARE NOT OBTAINED DATA
FROM STEREO IMAGES

H. Yanagi and H. Chikatsu

Page(s) 69-74

V/2: Cultural Heritage Data Acquisition and Processing

FROM POINT CLOUD TO 3D MODEL, MODELLING METHODS BASED ON ARCHITECTURAL
KNOWLEDGE APPLIED TO FORTRESS OF CHÂTEL-SUR-MOSELLE (FRANCE)

E. Alby and P. Grussenmeyer

Page(s) 75-80

HIGH RESOLUTION SURVEY OF PHAISTOS PALACE (CRETE) BY TLS AND TERRESTRIAL
PHOTOGRAMMETRY

M. Fabris, V. Achilli, G. Artese, D. Bragagnolo, and A. Menin

Page(s) 81-86

THE NEW THREE-DIMENSIONAL VISUALIZATION METHOD OF HERITAGE SITES BY LIDAR
DATA

N. Fujii, K. Saito, T. Chiba, I. Sata, T. Yoshinaga, and K. Tasaki

Page(s) 87-92

INCREASE OF READABILITY AND ACCURACY OF 3D MODELS USING FUSION OF CLOSE
RANGE PHOTOGRAMMETRY AND LASER SCANNING

M. Gašparović and I. Malarić

Page(s) 93-98

STEREOMETRIC MODELLING

P. Grimaldi

Page(s) 99-102

3D IMAGING FOR MUSEUM ARTEFACTS: A PORTABLE TEST OBJECT FOR HERITAGE AND
MUSEUM DOCUMENTATION OF SMALL OBJECTS

M. Hess and S. Robson

Page(s) 103-108

CONSERVATION MONITORING OF A HERITAGE CEILING BY PHOTOMETRIC STEREO

L. MacDonald, I. Gibb, and S. Robson

Page(s) 109-114

HIGH RESOLUTION 3D MODELING OF THE BEHAIM GLOBE

F. Menna, A. Rizzi, E. Nocerino, F. Remondino, and A. Gruen

Page(s) 115-120

PROTECTING UNESCO WORLD HERITAGE PROPERTIES'S INTEGRITY: THE ROLE OF
RECORDING AND DOCUMENTATION IN RISK MANAGEMENT FOR PETRA

M. Santana Quintero, G. Cesaro, F. Ishakat, A. Vandesande, O. Vileikis, A. Vadafari, A. Paolini,
K. Van Balen, and L. Fakhoury

Page(s) 121-126

IMAGING A SUSTAINABLE FUTURE IN 3D

W. Schuhr, J. D. Lee, and E. Kanngieser

Page(s) 127-131

HIGH-RESOLUTION SURFACE RECONSTRUCTION FROM IMAGERY FOR CLOSE RANGE
CULTURAL HERITAGE APPLICATIONS

K. Wenzel, M. Abdel-Wahab, A. Cefalu, and D. Fritsch

Page(s) 133-138

HIGH PRECISION TEXTURE RECONSTRUCTION FOR 3D SCULPTURE MODEL

F. Zhang, H. Huang, Z. Zhang, W. Fang, and D. Li

Page(s) 139-143

A METHOD OF 3D MEASUREMENT AND RECONSTRUCTION FOR CULTURAL RELICS IN MUSEUMS

S. Zheng, Y. Zhou, R. Huang, L. Zhou, X. Xu, and C. Wang

Page(s) 145-149

V/3: Terrestrial Laser Scanning and 3D Imaging

CO-REGISTRATION OF 3D POINT CLOUDS BY USING AN ERRORS-IN-VARIABLES MODEL

U. Aydar, M. O. Altan, O. Akyilmaz, and D. Akca

Page(s) 151-155

LANDSLIDE MONITORING USING TERRESTRIAL LASER SCANNER: GEOREFERENCING AND CANOPY FILTERING ISSUES IN A CASE STUDY

M. Barbarella and M. Fiani

Page(s) 157-162

ANALYSIS OF MOBILE LASER SCANNING DATA AND MULTI-VIEW IMAGE RECONSTRUCTION

C. Briese, G. Zach, G. Verhoeven, C. Ressler, A. Ullrich, N. Studnicka, and M. Doneus

Page(s) 163-168

CYLINDER-BASED SELF-CALIBRATION OF A PANORAMIC TERRESTRIAL LASER SCANNER

T. On Chan and D. D. Lichti

Page(s) 169-174

PERFORMANCE ANALYSIS OF A LOW-COST TRIANGULATION-BASED 3D CAMERA:
MICROSOFT KINECT SYSTEM

J. C. K. Chow, K. D. Ang, D. D. Lichti, and W. F. Teskey

Page(s) 175-180

RIGOROUS POINT-TO-PLANE REGISTRATION OF TERRESTRIAL LASER SCANS

D. Grant, J. Bethel, and M. Crawford

Page(s) 181-186

AUTOMATIC PROCESSING OF MOBILE LASER SCANNER POINT CLOUDS FOR BUILDING
FAÇADE DETECTION

N. H. Arachchige, S. N. Perera, and H.-G. Maas

Page(s) 187-192

CURB-BASED STREET FLOOR EXTRACTION FROM MOBILE TERRESTRIAL LIDAR POINT
CLOUD

S. Ibrahim and D. Lichti

Page(s) 193-198

CONTINUOUSLY DEFORMATION MONITORING OF SUBWAY TUNNEL BASED ON
TERRESTRIAL POINT CLOUDS

Z. Kang, L. Tuo, and S. Zlatanova

Page(s) 199-203

AUTOMATED FEATURE BASED TLS DATA REGISTRATION FOR 3D BUILDING MODELING
K. Kitamura, N. Kochi, and S. Kaneko
Page(s) 205-210

AUTOMATIC PROCEDURE FOR THE REGISTRATION OF THERMOGRAPHIC IMAGES WITH
POINT CLOUDS
S. Lagüela, J. Armesto, P. Arias, and A. Zakhor
Page(s) 211-216

ROBUST REAL-TIME AND ROTATION-INVARIANT AMERICAN SIGN LANGUAGE ALPHABET
RECOGNITION USING RANGE CAMERA
H. Lahamy and D. Lichti
Page(s) 217-222

A NEW APPROACH FOR SUBWAY TUNNEL DEFORMATION MONITORING: HIGH-
RESOLUTION TERRESTRIAL LASER SCANNING
J. Li, Y. Wan, and X. Gao
Page(s) 223-228

AN AUTOMATIC PROCEDURE FOR COMBINING DIGITAL IMAGES AND LASER SCANNER
DATA
W. Moussa, M. Abdel-Wahab, and D. Fritsch
Page(s) 229-234

DEFORMATION MONITORING OF MOTORWAY UNDERPASSES USING LASER SCANNING
DATA
I. Puente, H. González-Jorge, B. Riveiro, and P. Arias
Page(s) 235-238

DYNAMIC CONCRETE BEAM DEFORMATION MEASUREMENT WITH 3D RANGE CAMERAS

X. Qi and D. Lichte

Page(s) 239-244

A METHOD FOR THE REGISTRATION OF HEMISPHERICAL PHOTOGRAPHS AND TLS
INTENSITY IMAGES

A. Schmidt, A. Schilling, and H.-G. Maas

Page(s) 245-249

TOWARDS TRANSPARENT QUALITY MEASURES IN SURFACE BASED REGISTRATION
PROCESSES: EFFECTS OF DEFORMATION ONTO COMMERCIAL AND SCIENTIFIC
IMPLEMENTATIONS

D. Wujanz

Page(s) 251-256

V/4: Image-Based and Range-Based 3D Modelling

APPLYING CCD CAMERAS IN STEREO PANORAMA SYSTEMS FOR 3D ENVIRONMENT
RECONSTRUCTION

A. Sh. Amini, M. Varshosaz, and M. Saadatesresht

Page(s) 257-260

ESTIMATION OF TREE STEM ATTRIBUTES USING TERRESTRIAL PHOTOGRAMMETRY

M. Forsman, N. Börnin, and J. Holmgren

Page(s) 261-265

SIMPLE ROOM SHAPE MODELING WITH SPARSE 3D POINT INFORMATION USING
PHOTOGRAMMETRY AND APPLICATION SOFTWARE

S. Hirose

Page(s) 267-272

AUTOMATIC TEXTURE MAPPING OF ARCHITECTURAL AND ARCHAEOLOGICAL 3D MODELS

T. P. Kersten and D. Stallmann

Page(s) 273-278

3D MODELING OF ARCHITECTURE BY EDGE-MATCHING AND INTEGRATING THE POINT CLOUDS OF LASER SCANNER AND THOSE OF DIGITAL CAMERA

N. Kochi, K. Kitamura, T. Sasaki, and S. Kaneko

Page(s) 279-284

DETAILED PRIMITIVE-BASED 3D MODELING OF ARCHITECTURAL ELEMENTS

F. Remondino, D. Lo Buglio, N. Nony, and L. De Luca

Page(s) 285-290

FROM GEOMETRY TO DIAGNOSIS: EXPERIENCES OF GEOMATICS IN STRUCTURAL ENGINEERING

B. Riveiro, P. Arias, J. Armesto, J. C. Caamaño, and M. Solla

Page(s) 291-296

A NOVEL IMAGE ACQUISITION AND PROCESSING PROCEDURE FOR FAST TUNNEL DSM PRODUCTION

R. Roncella, G. Umili, and G. Forlani

Page(s) 297-302

FULLY AUTOMATED IMAGE ORIENTATION IN THE ABSENCE OF TARGETS

C. Stamatopoulos, T. Y. Chuang, C. S. Fraser, and Y. Y. Lu

Page(s) 303-308

IMPLEMENTING AN ADAPTIVE APPROACH FOR DENSE STEREO-MATCHING

C. Stentoumis, L. Grammatikopoulos, I. Kalisperakis, and G. Karras

Page(s) 309-314

V/5: Image Sensor Technology

PRODUCING A LINEAR LASER SYSTEM FOR 3D MODELING OF SMALL OBJECTS

A. Sh. Amini and M. H. Mozaffar

Page(s) 315-319

GEOMETRIC PROPERTIES OF A MECHANICAL FORWARD MOTION COMPENSATION SYSTEM CONTROLLED BY A PIEZOELECTRIC DRIVE

F. Collette, S. Gline, J. Losseau, and L. Lecharlier

Page(s) 321-325

STUDY ON THE LINE SCAN CCD CAMERA CALIBRATION OF VEHICLE-BORNE 3D DATA ACQUISITION SYSTEM

Y. Han, B. Yang, and F. Zhang

Page(s) 327-331

INVESTIGATIONS ON A COMBINED RGB / TIME-OF-FLIGHT APPROACH FOR CLOSE RANGE APPLICATIONS

H. Hastedt and Th. Luhmann

Page(s) 333-338

ROBUST PERSON TRACKING WITH MULTIPLE NON-OVERLAPPING CAMERAS IN AN
OUTDOOR ENVIRONMENT

S. Hellwig and N. Treutner

Page(s) 339-344

The Scanning Photogrammetry

T. Ke, Z. X. Zhang, and S. Huang

Page(s) 345-349

NEW AIRBORNE SENSORS AND PLATFORMS FOR SOLVING SPECIFIC TASKS IN REMOTE
SENSING

G. Kemper

Page(s) 351-356

STUDY ON SHADOW EFFECTS OF VARIOUS FEATURES ON CLOSE RANGE THERMAL
IMAGES

C. L. Liao and H. H. Huang

Page(s) 357-361

CALIBRATION AND EPIPOLAR GEOMETRY OF GENERIC HETEROGENOUS CAMERA
SYSTEMS

A. Luber, D. Rueß, K. Manthey, and R. Reulke

Page(s) 363-368

ASSISTED CONTROL POINT MEASUREMENT FOR CLOSE RANGE PHOTOGRAMMETRY.

E. Mata, M. A. Hernandez, J. Cardenal, and J. L. Perez

Page(s) 369-373

ACCURACY EVALUATION OF STEREO CAMERA SYSTEMS WITH GENERIC CAMERA MODELS

D. Rueß, A. Luber, K. Manthey, and R. Reulke

Page(s) 375-380

ASSESSING THE PHOTOGRAMMETRIC POTENTIAL OF CAMERAS IN PORTABLE DEVICES

M. J. Smith and N. Kokkas

Page(s) 381-386

ACCURACY ASPECTS OF UTILIZING RAW IMAGERY IN PHOTOGRAMMETRIC MEASUREMENT

C. Stamatopoulos, C. S. Fraser, and S. Cronk

Page(s) 387-392

AUTOMATED LOW-COST PHOTOGRAMMETRY FOR FLEXIBLE STRUCTURE MONITORING

C. H. Wang, J. P. Mills, and P. E. Miller

Page(s) 393-398

V/6: Close Range Morphological Measurement for the Earth Sciences

LABORATORY FLUME EXPERIMENT WITH A CODED STRUCTURED LIGHT SYSTEM

D. Akca and H. Seybold

Page(s) 399-404

DEM ASSESSMENT DERIVED FROM CLOSE RANGE PHOTOGRAMMETRY: A CASE STUDY FROM KADAVUR AREA, KARUR DISTRICT, TAMIL NADU, INDIA

S. Anbarasan and R. Sakthivel

Page(s) 405-410

PHOTOGRAMMETRY AND LASER SCANNING FOR THE EARTH SCIENCES WORKING GROUP
V6

J. H. Chandler, S. J. Buckley, D. Rieke-Zapp, and R. Wackrow

Page(s) 411-416

CLOSE RANGE HYPERSPECTRAL IMAGING INTEGRATED WITH TERRESTRIAL LIDAR
SCANNING APPLIED TO ROCK CHARACTERISATION AT CENTIMETRE SCALE

T. H. Kurz, S. J. Buckley, and J. A. Howell

Page(s) 417-422

MULTIDIMENSIONAL ROUGHNESS CHARACTERIZATION FOR MICROWAVE REMOTE
SENSING APPLICATIONS USING A SIMPLE PHOTOGRAMMETRIC ACQUISITION SYSTEM

P. Marzahn, D. Rieke-Zapp, U. Wegmuller, and R. Ludwig

Page(s) 423-428

IN SITU MEASUREMENT OF BEDROCK EROSION

D. H. Rieke-Zapp, A. Beer, J. M. Turowski, and L. Campana

Page(s) 429-433

STUDYING GLACIAL MELT PROCESSES USING SUB-CENTIMETER DEM EXTRACTION AND
DIGITAL CLOSE-RANGE PHOTOGRAMMETRY

E. Sanz-Ablanedo, J. H. Chandler, and T. D. L. Irvine-Fynn

Page(s) 435-440

KILIMANJARO ICE CLIFF MONITORING WITH CLOSE RANGE PHOTOGRAMMETRY

M. Winkler, W. T. Pfeffer, and K. Hanke

Page(s) 441-446

ICWG V/I: Land-Based Mobile Mapping Systems

Applications of Mobile GIS in Forestry South Australia

D. T. Battad and P. Mackenzie

Page(s) 447-452

STEREOVISION MOBILE MAPPING: SYSTEM DESIGN AND PERFORMANCE EVALUATION

J. Burkhard, S. Cavegn, A. Barmettler, and S. Nebiker

Page(s) 453-458

PANORAMIC EPIPOLAR IMAGE GENERATION FOR MOBILE MAPPING SYSTEM

T. Chen, K. Yamamoto, S. Chhatkuli, and H. Shimamura

Page(s) 459-464

OBJECT-SPACE MULTI-IMAGE MATCHING OF MOBILE-MAPPING-SYSTEM IMAGE SEQUENCES

Y. C. Chen, Y. H. Tseng, C. Y. Hsieh, P. C. Wang, and P. C. Tsai

Page(s) 465-470

BENCHMARKING MOBILE LASER SCANNING SYSTEMS USING A PERMANENT TEST FIELD

H. Kaartinen, A. Kukko, J. Hyypä, and A. Jaakkola

Page(s) 471-476

THE RAILMAPPER – A DEDICATED MOBILE LIDAR MAPPING SYSTEM FOR RAILWAY NETWORKS

J. Kremer and A. Grimm

Page(s) 477-482

MULTIPLATFORM APPROACH TO MOBILE LASER SCANNING

A. Kukko, H. Kaartinen, J. Hyypä, and Y. Chen

Page(s) 483-488

ERROR DISTRIBUTION EVALUATION OF THE THIRD VANISHING POINT BASED ON
RANDOM STATISTICAL SIMULATION

C. Li

Page(s) 489-493

EMPIRICAL ACCURACY ASSESSMENT OF MMS LASER POINT CLOUDS

K. Mano, K. Ishii, M. Hirao, K. Tachibana, M. Yoshimura, D. Akca, and A. Gruen

Page(s) 495-498

GENERATION OF HIGH RESOLUTION AND HIGH PRECISION ORTHORECTIFIED ROAD
IMAGERY FROM MOBILE MAPPING SYSTEM

M. Sakamoto, K. Tachibana, and H. Shimamura

Page(s) 499-504

IMPLEMENTATION AND EVALUATION OF A MOBILE MAPPING SYSTEM BASED ON
INTEGRATED RANGE AND INTENSITY IMAGES FOR TRAFFIC SIGNS LOCALIZATION

M. Shahbazi, M. Sattari, S. Homayouni, and M. Saadatsresht

Page(s) 505-510

V/6, IV/8: Morphological Change Detection

TERRESTRIAL LASER SCANNING FOR COASTAL GEOMORPHOLOGIC RESEARCH IN
WESTERN GREECE

D. Hoffmeister, N. Tilly, C. Curdt, H. Aasen, K. Ntageretzis, H. Hadler, T. Willershäuser, A. Vött, and

G. Bareth
Page(s) 511-516

DETECTION AND QUANTIFICATION OF ROCK GLACIER CREEP USING HIGH-RESOLUTION
ORTHOIMAGES OF VIRTUAL GLOBES

V. Kaufmann
Page(s) 517-522

PILOT STUDIES WITH A PHOTOGRAMMETRIC GLACIER LAKE OUTBURST FLOOD EARLY
WARNING SYSTEM

H. G. Maas, C. Mulsow, A. Wendt, and G. Casassa
Page(s) 523-527

GEOSPATIAL DATA INTEGRATION FOR ASSESSING LANDSLIDE HAZARD ON ENGINEERED
SLOPES

P. E. Miller, J. P. Mills, S. L. Barr, and S. J. Birkinshaw
Page(s) 529-534

CIPA, ICOMOS and V/2: Advances in Digital Documentation

AN APPROACH TO FIND LOCALIZATION OF NON-EXISTENT HISTORICAL BUILDINGS BY
TERRESTRIAL PHOTOGRAMMETRY

U. Acar, B. Bayram, and H. I. Cetin
Page(s) 535-539

PHOTOGRAMMETRIC AND LIDAR DOCUMENTATION OF THE ROYAL CHAPEL
(CATHEDRAL-MOSQUE OF CORDOBA, SPAIN)

J. Cardenal, J. L. Perez-Garcia, E. Mata, M. A. Hernandez, A. Mozas, J. Delgado, A. Lopez-Arenas, and
J. E. Meroño

Page(s) 541-546

ADVANCING THE DOCUMENTATION OF BURIED ARCHAEOLOGICAL LANDSCAPES

W. Neubauer, M. Doneus, and I. Trinks

Page(s) 547-552

RECORDING APPROACH OF HERITAGE SITES BASED ON MERGING POINT CLOUDS FROM HIGH RESOLUTION PHOTOGRAMMETRY AND TERRESTRIAL LASER SCANNING

P. Grussenmeyer, E. Alby, T. Landes, M. Koehl, S. Guillemin, J. F. Hullo, P. Assali, and E. Smigiel

Page(s) 553-558

COSTLESS PLATFORM FOR HIGH RESOLUTION STEREOSCOPIC IMAGES OF A HIGH GOTHIC FACADE

R. Héno, L. Chandelier, and D. Schelstraete

Page(s) 559-564

HYDROLOGIC AND FEATURE-BASED SURFACE ANALYSIS FOR TOOL MARK INVESTIGATION ON ARCHAEOLOGICAL FINDS

K. Kovács and K. Hanke

Page(s) 565-570

ARTEFACT MOBILE DATA MODEL TO SUPPORT CULTURAL HERITAGE DATA COLLECTION AND INTERPRETATION

Z. S. Mohamed-Ghouse, D. Kelly, A. Costello, and V. Edmonds

Page(s) 571-576

COMPARISON OF LOW ALTITUDE PHOTOGRAMMETRIC METHODS FOR OBTAINING DEMS AND ORTHOIMAGES OF ARCHAEOLOGICAL SITES

A. T. Mozas-Calvache, J. L. Pérez-García, F. J. Cardenal-Escarcena, J. Delgado, and E. Mata-deCastro

Page(s) 577-581

ARCHAEOLOGICAL SITE MONITORING: UAV PHOTOGRAMMETRY CAN BE AN ANSWER

F. Rinaudo, F. Chiabrando, A. Lingua, and A. Spanò

Page(s) 583-588

LASER SCANNER SURVEY TO CULTURAL HERITAGE CONSERVATION AND RESTORATION

G. Vacca, M. Deidda, A. Dessi, and M. Marras

Page(s) 589-594

Additional Papers

COMPARISON OF METHODS FOR GEOMETRIC CAMERA CALIBRATION

J. Hieronymus

Page(s) 595-599

ON THE ESTIMATION OF RIGID-BODY TRANSFORMATION FOR TLS REGISTRATION

M. Scaioni

Page(s) 601-606

SIMULATION OF MUX CAMERA IMAGES OF THE BRAZIL-CHINA SATELLITE EARTH
RESOURCES (CBERS-3)

G. A. Boggione, L. M. G. Fonseca, S. Bosch-Puig, and F. J. Ponzoni

Page(s) 607-612