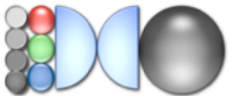
National Institute of Physics
College of Science
University of the Philippines Diliman
Quezon City 1101 Philippines

Annual Report for 2015



Instrumentation Physics Laboratory

Prepared and Submitted by:

Johnrob Y. Bantang, PhD
Coordinator, IPL

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NIP Management
Research Accomplishments of the NIP IPL Research Group
January 1, 2015 - December 31, 2015

Prepared by:

Johnrob Y. Bantang, PhD
Program Coordinator
23 January 2016 (updated, 25 Jan)

I. Executive Summary

The University of the Philippines (UP) recently shifted its academic calendar such that semesters start from August (1st semester) and from January (2nd semester). Thus, the year now includes three(3) terms of three academic calendars: Second Semester of AY 2014-15, Midyear Term 2015, and First Semester of AY 2015-16. January 2015 marked a start of organizational meetings in every first Monday on or after the start of the academic classes in UP Diliman. That semester, IPL is able to graduate a some of its students by May and June. Most senior members successfully participated in the year's SPP Congress and conference (SPP2015) last June 2015 at the University of the Northern Philippines, Vigan City, Ilocos Norte. Several DOST-SEI scholars were also accepted as summer intern by March 2015. June-July 2015 is also marked by service to Philippine Science Highschool system as IPL participated in accepting Summer School Internship Program (SSIP).

Application of new members started in August 2015 and by October, IPL has accepted 18 new undergraduate students becoming 85 in size inclusive of the six PhD staff members. IPL had a Year Ender and Christmas Party last December 2015 in conformity with the season all around the Campus.

The Year 2015 is also marked with a milestone of creating the first Social Media Policy for a laboratory in NIP. It was drafted by the IPL Graduate Students, discussed among the members of the laboratory (without the presence of staff members) and were ratified by the IPL Staff. Currently it remains as an internal document applicable to all members of the laboratory as well as research collaborators wherever applicable.

The following summarizes the activities and accomplishments of Instrumentation Physics Laboratory from January 2015 to December 2015.

A. Activities of the Research Group

1. Organization

As of December 2015, IPL having a total of 85 members is broken down as follows.
a. PhD Staff Members (6)
b. Student Members (79)

The distribution of the types of student members in IPL is shown in Figure I-1. The distribution follows a decreasing trend for undergraduate students from Junior (BS3) standing to Graduating (BS5 up) indicator of growth in the past years and the increase in the absorbing capacity of the laboratory for mentoring students. MS and PhD Senior students are those MS1, PhD1 and PhD2. Graduating status is granted to those MS2 up and PhD3 up. The greater number of graduating graduate students could be an indicator of the challenge of having them graduate in 2016.

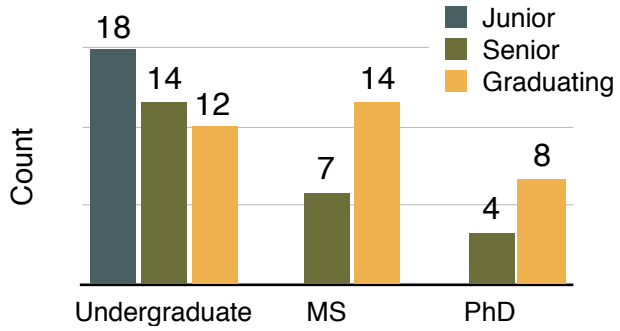

Figure I-1: Distribution of the types of members in IPL as of December 2015. Junior refers to BS3 students, senior students are those BS4, MS1 or PhD1/PhD2. BS5, MS2 and PhD3 and higher are labeled graduating.

2. Mentoring

Figure I-2 shows a total of 18 students graduated with IPL in the year 2015 and distributed based on the degree obtained. No one graduated during the Midyear Term 2015. All degree programs end in the second semester resulting to a marked decline in the graduation rate in the 1st sem of AY 2015-16.

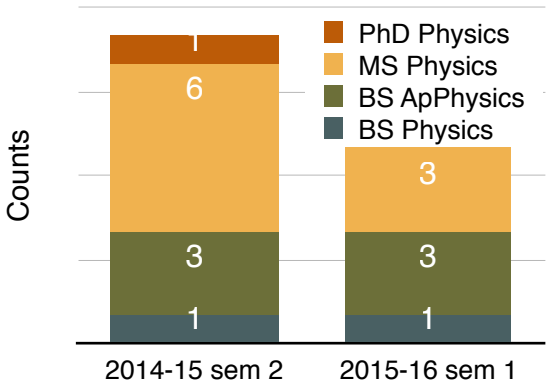

Figure I-2: Distribution of the degrees obtained by IPL members as of December 2015 during the 2nd Semester of AY 2014-15 and the 1st Semester of AY 2015-16. No one graduated during the Midyear term of 2015. No member of IPL is under the MSE program.

B. Research Highlights

Publications. Figure I-3 shows the sustained positive trend in the total number of publications by IPL over the years. Since 1995, the overall trend of about nine(9) authored ISI/SCI paper per year shows the expected 200th article in the year 2016 having reached a total of 194 papers in SCI/ISI journals.

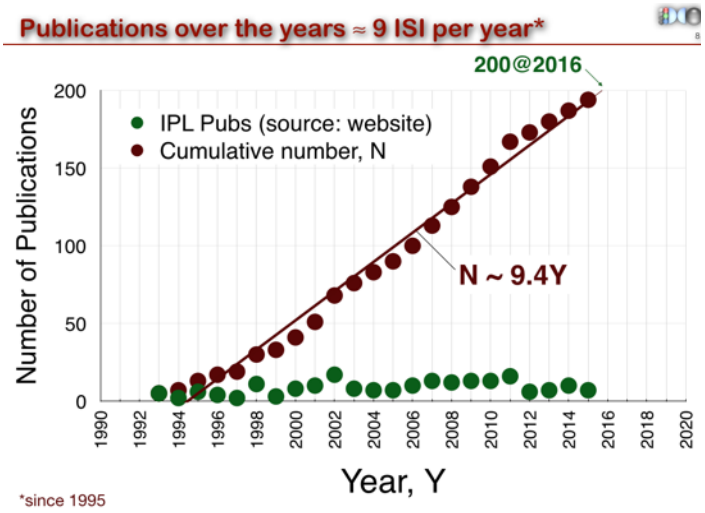

Figure I-3: Cumulative publications of IPL since 1993. The cumulative trend since 1995 predicts a 200th publication coming in the coming 2016 with the current number of 194 as of December 2015.

Figure I-4 shows the types of publications were made by IPL members having published seven in 2015, more than 85% of the total publication is submitted in local conferences. Participation in international conferences has started to become significant and is expected to increase in the next year.

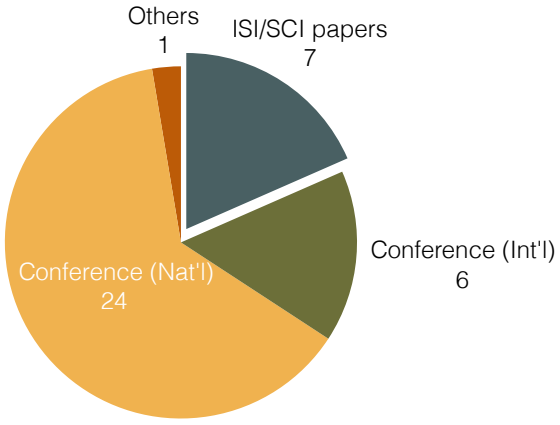

Figure I-4: A pie graph summarizing the authored publications of IPL members for 2015. It shows that majority of the publications are national.

Projects. IPL projects come from both within and without the Institute. Table I-1 shows a summary of the research and fundings IPL has. It is assumed that most of the NIP funding are grants that go directly to faculty honoraria. Bulk of the funding comes from without as it is used for capital outlay, personnel services and other equipment grants. Besides, common supplies are funded by NIP MOOE with a total of PhP 100,000 appropriated per annum, not included in the table presented below.

Table I-1: Summary of IPL Projects

Type of funding	*Number of projects*	*Amount*
NIP	5	₱ 514,800.00
non-NIP	6	₱ 21,613,071.00
Totals	**11**	**₱ 22,127,871.00**

Major Equipment. A total of PhP 579,836.96 worth of equipment has also been procured in IPL.

Extension work. Under direct supervision of Prof. Maricor N. Soriano, IPL was able to host a total of six(6) students in a science internship program (SIP) together with the Philippine Science High School System (3 students) and in a DOST-SEI summer practical training program (3 students from University of Northern Philippines, Vigan).

Other Accomplishments. Notable positions were occupied by IPL members such as Prof. Saloma being a continuing Editor-In-Chief of the Philippine Science Journal as well as

A more detailed information is provided by the Technical Report that follows.

II. Technical Report

A. Activities of the Research Group

IPL had organizational meetings in every first Monday on or after the start of the academic classes in UP Diliman followed by General Cleaning per subgroup. Several DOST-SEI scholars were also accepted as summer intern by March 2015. By the end of 2nd Semester of AY2014-15, IPL is able to graduate a some of its students. Most members participated in the year's SPP Congress on June 2015 at the University of the Northern Philippines, Vigan City, Ilocos Norte. June-July 2015 is also marked by service to Philippine Science Highschool system as IPL participated in accepting Summer School Internship Program (SSIP). IPL has accepted 18 new undergraduate students becoming 85 in size inclusive of the seven PhD staff members. The whole year is capped by year-ender and Christmas party of the laboratory.

1. Organization

(a) Staff Members (6 PhD):

- Prof. Caesar A. Saloma;
- Prof. Maricor N. Soriano;
- Prof. Giovanni A. Tapang;
- Prof. May T. Lim (current institute Dep. Director for Academic Affairs);
- Assoc. Prof. Johnrob Y. Bantang (Lab Coordinator, Physics 10 and NIP IT coordinator)
- Asst. Prof. Rene C. Batac

(b) Active Adjunct Researchers (4):

- Prof. Cynthia Palmes-Saloma (NIMBB, UPD)
- Dr. Ranzivelle Marianne Roxas-Villanueva (UP Los Baños)
- Dr. Atchong Hillario (UPD College of Engineering)
- Dr. Marissa G. Pastor (University of San Carlos)

(c) IPL does not accept apprenticeship.

(d) The list of regular student members is shown in *Table II-1, next page* (79).

Table II-1: List of Student Members of IPL (as of Dec 2015) (79)

Type	Surname	Given Name	Type	Surname	Given Name	Type	Surname	Given Name
BS3	Cruz	Antonio Miguel	BS4	Zoluaga	Jan Parvin	MS1	Aguilar	Ritz Ann
BS3	Escosio	Ray Audie	BS4	Santiago	Joshua	MS2	Tarun	Anjali
BS3	Medina	Elijah Justin	BS4	Romero	Roland Albert	MS2	Balingit	Chester
BS3	Biton	Dionessa	BS4	Hilado	Jeremy	MS2	Alagao	Mary Angelie
BS3	Abella	Jasmine Michelle	BS4	Medrana	Micholo	MS2	Improso	Wynn Dunn
BS3	Orden	Alfiero II	BS4	Chua	Gilbert	MS2	Melgarejo	Krista Iris
BS3	Perlada	Camille	BS4.5	Abuel	Josh	MS2	Rarugal	Aimee
BS3	Fenis	Ivan	BS4.5	Ramos	Reinier	MS2	Algodon	Meryl
BS3	Huang	Clyde	BS4.5	Yumol	Albert	MS2	Borja	Benjur Emmanuel
BS3	Rizada	Lloyd Gabriel	BS5	Cabatit	Cephas Olivier	MS2	Gallanosa	Phoebe
BS3	Canceran	Derick	BS5	Olivares	Jaime Lorenzo	MS2	Masil	Bernadette
BS3	Del Rosario	Ronillo	BS5	Aguinaldo	Ralph Aaron	MS2	Santos	Alix Jean
BS3	Euste	John Lawrence	BS5	Jubilo	Karol Guissepe	MS3	Maulion	John Paulo
BS3	Mangsat	Crystal Jill	BS5	Naces	Carl Jesse	MS3	Cabangon	Jean
BS3	Rebong	Raymond Luke	BS5	Negre	Julia Rio	MS3	Valgomera	Christian
BS3	De Luna	Marie Gabrielle	BS5.5	Canete	Ariel Carlos	MS4	Dagum	Laurice
BS3	Lao	David Ryan	BS5.5	Nasayao	Jessica	PhD1	Sison	Gabriel Dominik
BS3	Perit	Charmaine	BS5.5	Suratos	Aldrich	PhD1	Roque	Kristine Faith
BS4	Guial	Kit Laurence	BS6	Torres	Elexis Mae	PhD1	Ventura	Maria Eloisa
BS4	Rubio	John Kenneth	BS7	Roberto	Lugienor Lucille	PhD2	Presbitero	Alva
BS4	Banasig	Lois Danielle	BS7.5	Uy	Gilian	PhD4	Paguirigan Jr.	Antonino
BS4	Cirunay	Michelle	MS1	Urog	Krister Jazz	PhD5	Pedemonte	Gerold
BS4	Rubio	Louie	MS1	Jayin	Abigail	PhD8	Separa	Stephen Daedalus
BS4	Vistal	Jona	MS1	Dailisan	Damian	PhD8	Pulido	Maria Teresa
BS4	Bacong	Junelle	MS1	Pasion	Pamela Anne			
BS4	Fox	Anthony	MS1	Abella	Alfred			

(e) The summary of membership is shown in *Table II-1* below.

Table II-1: Summary of IPL membership status

Member Type	Degree	Count
PhD Staff		6
Student members	B3	18
	B4	14
	B5 and above	15
	M1	6
	M2 and above	14
	P1	3
	P2	1
	P3 and above	8
Adjunct Researchers		4
Apprenticeship		
	TOTAL:	**89**

2. Mentoring

a. List of graduates since January 2015 (as of December 2015)

Table II-2a: List of graduates for the 2nd Semester of AY 2014-15

Program	Student Name	Thesis Title	Defense Date	Adviser(s)
BS Physics	Pio Gabrielle Calderon	Metapopulation Dynamical Model of Denque Epidemics that Incorporates Human Host Mobility	May 21	Johnrob Y. Bantang
BS Applied Physics	Alfred Abella	Generation of Oscillons, Vortices, and Orbital Traps from Three Dimensional Fluid Motion of Propagating Surface Waves	May 22	Maricor N. Soriano
BS Applied Physics	Damian Dailisan	Modeling Adaptive Driving in Heterogeneous Two Lane Traffic Flow	May 22	May T. Lim
BS Applied Physics	Ritz Ann Aguilar	Phase-Shift Profilometry Calibration for an Artifact-Free 3D Reconstruction	May 21	Maricor N. Soriano
MS Physics	Elmer Arapoc	Lattice Boltzmann Modeling of the Advection of Oil in Water	May 21	Maricor N. Soriano
MS Physics	Aimee Rarugal	Spatiotemporal Characterization and Forecasting of Real World Datasets	May 22	Giovanni A. Tapang; (co) Ranzivelle Marianne R. Villanueva

Program	Student Name	Thesis Title	Defense Date	Adviser(s)
MS Physics	Kristine Faith Roque	Optical Trapping of Elliptically Symmetric Objects in the Geometric Optics Regime	May 23	Giovanni A. Tapang; (co) Caesar A. Saloma
MS Physics	Maria Isabel Saludares	Localization and tracking of Players Using Multiple Cameras	May 23	Maricor N. Soriano
MS Physics	Maria Eloisa Ventura	Dynamic Control of Light for Microscopy and Imaging Applications	May 23	Giovanni A. Tapang; (co) Caesar A. Saloma
MS Physics	Gabriel Dominik Sison	Information Flows in Networks of Coupled Oscillators	May 21	Giovanni A. Tapang
PhD Physics	Junius Andre Balista	The Modified Inelastic Bouncing Ball Model of the Brazil Nut Effect And the Reverse Brazil Nut Effect	May 18	Caesar A. Saloma

Table II-2b: List of graduates for the 1st Semester of AY 2015-16

Program	Student Name	Thesis Title	Defense Date	Adviser(s)
MS Physics	Mary Angeline Alagao	Characterization of a segmented reflecting telescope	Dec 1	Maricor N. Soriano; (co) Giovanni A. Tapang
MS Physics	Laurice Janette Dagum	Mosaicking and Change Detection of Underwater Scenes Taken by Multiple Cameras	Dec 1	Maricor N. Soriano
BS Physics	Aldrich Suratos	Estimating Agent- Based Traffic Model Parameters Using Optical Flow Analysis on Webcam Videos	Dec 2	May T. Lim
MS Physics	Benjur Emmanuel Borja	Modeling Spatial and Temporal Population Distributions Using Satellite Imagery and Ancillary Data	Dec 2	Maricor N. Soriano
BS Applied Physics	Ariel Carlos Canete	Human Mobility Models Constructed with Transit Feed Data	Dec 3	May T. Lim
BS Applied Physics	Gilian Uy	Wireless Sensor Network Construction Periodic Installation of Sensors by Anisotropic Random Walkers	Dec 3	May T. Lim
BS Applied Physics	Julia Rio Therese Negre	Image Enhancement of Underwater Image Using Sand as a Natural Achromatic Balancing Reference	Dec 3	Maricor N. Soriano

b. Summary counts of graduates in 2015. Entries with zero count is not shown (MSE programs). Zero entries are removed for clarity.

Table II-3: Summary counts of graduates in 2015

Course	2014-15 sem 2	Mid 2015	2015-16 sem 1	Total
BS Physics	1		1	2
BS ApPhysics	3		3	6
MS Physics	6		3	9
PhD Physics	1			1
TOTAL COUNTS:	11		7	**18**

B. Research Highlights

1. ISI/SCI Journal publications (7, non-ISI: 1)

1. C Saloma, GJ Perez, CA Gavile, JJ Ick-Joson, C Palmes-Saloma. *Prior Individual Training and Self-Organized Queuing during Group Emergency Escape of Mice from Water Pool.* PloS one 10 (2), e0118508
2. JAF Balista, C Saloma. *Modified inelastic bouncing ball model for describing the dynamics of granular materials in a vibrated container.* Physica D: Nonlinear Phenomena 291, 17-20
3. x CM Alis, MT Lim, HS Moat, D Barchiesi, T Preis, SR Bishop. *Quantifying regional differences in the length of Twitter messages.* PloS one 10 (4)
4. JCS Pang, JY Bantang. *Hodgkin–Huxley neurons with defective and blocked ion channels.* International Journal of Modern Physics C, 1550112
5. RC Batac. *Statistical Properties of the Immediate Aftershocks of the 15 October 2013 Magnitude 7.1 Earthquake in Bohol, Philippines.* Acta Geophysica DOI: 10.1515/acgeo-2015-0054
6. AA Paguirigan, CP Monterola, RC Batac. *Loss of criticality in the avalanche statistics of sandpiles with dissipative sites.* Communications in Nonlinear Science and Numerical Simulation 20 (3), 785-793
7. AB Tarun, AA Paguirigan, RC Batac. *Spatiotemporal recurrences of sandpile avalanches.* Physica A: Statistical Mechanics and its Applications 436, 293-300
8. AMC Jayin, RC Batac. *Finding trends and statistical patterns in name mentions in news.* arXiv preprint arXiv:1507.02449

2. Conference proceedings (international) (4)

1. ME Ventura, PLA Hilario, G Tapang, C Saloma. *Bessel beam scanning without mechanical scanner.* Conference on Lasers and Electro-Optics/Pacific Rim, 26P_91
2. KFJ Roque, GA Tapang, CA Saloma. *Parametric study of axial trapping forces on an elliptically symmetric dielectric in the ray optics regime*. International Conference on Photonics Solutions 2015, 96591M-96591M-6
3. P. Gallanosa, M. Soriano. 2015. “Image Alignment Of Historical And Current Cebu Maps To Determine River Path Changes And Flooding Pattern” Humanitarian Technologies for Disaster Prevention and Risk Reduction Waterfront Hotel, Cebu City, Philippines, December 9-12, 2015 (to be published)
4. B. Masil, M. Soriano. 2015. “Line Drawing Enhancement Of Historical Architectural Plan Using Difference-Of-Gaussians Filter” Humanitarian Technologies for Disaster Prevention and Risk Reduction Waterfront Hotel, Cebu City, Philippines, December 9-12, 2015 (to be published)

2. Conference proceedings (international, no abstract) (2)

1. *B. Borja, M. Soriano.2015. "Population Mapping Using Image Processing and Ancillary Data to Support Risk and Damage Assessment." Int'l. Conference on Disasters in Asia 2015, Tagbilaran Bohol, 20-21 January 2015*
2. *M. Algodon, A. Hilomen, M. Soriano. 2015. "Estimating Coral Reef Slope or Camera Pitch from Video." OCEANS MTS 2015, Washington DC, 19-22 Dec. 2015.*

3. Conference papers (local) (24)

Oral presentations during 33rd SPP Physics Congress (Vigan, Ilocos Norte)

1. (Plenary) RAA Romero, G. Tapang. *Compressive sampling on hologram phase maps*
2. (Sub-Plenary) M Lim. *Big data analytics: From Twitter to Facebook*
3. PGB Calderon, RV Destura, JY Bantang. *Investigating the role of quarantine and screening efficiency in dengue epidemics*
4. RC Batac, C David, A Paguirigan, A Tarun. *Geographical Nearest-Neighbor Networks of Philippine Public Schools*
5. MC Jamerlan, G Tapang, RM Roxas-Villanueva. *Characterization of Filipino folk songs using a network approach*
6. JRP Pingol, RMR Villanueva, PLA Hilario, GA Tapang. *VISSER as an Effective Teaching Tool: Determining the Immediate Impact of VISSER in Cognitive Learning*
7. (Sub-plenary) G. Tapang. *Versatile Instrumentation System for Science Education System (VISSER) Workshop*
8. MI Saludares, MN Soriano. *Tracking and analysis of football player movements using image flow*
9. RAP Aguilar, MN Soriano. *Phase-shift profilometry calibration through filtering in Fourier domain and background subtraction with bicubic interpolation*
10. Abella, A., and M. Soriano. *Video-based wave topography mapping and particle tracking on the surface of propagating waves*
11. Nd Mascariñas, MA Alagao, G Tapang. *Low-cost spectrometer using light emitting diode array*
12. PB Gallanosa, MN Soriano. *Determining relationship between river path changes and flooding through alignment of historical and current maps*
13. RJS Cabangon, KFJ Roque, SD Jacinto, GA Tapang. *Exposure of the human colon cancer cell line (HCT116) to various light wavelengths*
14. CGS Mendoza, ND Mascarinas, MC Carasco, G Tapang. *Ground movement detection using a wireless accelerometer*
15. JPR Maulion, JY Bantang. *Percolation phase transition in random geometric networks*
16. LAV Presbitero, JY Bantang. *Comparing One–Truck–Lane with Random Scheme using Nagel–Schreckenberg and Tailgating Models*
17. AB Tarun, RC Batac, A Paguirigan. *Spatiotemporal analysis of the recurrent avalanche events in the continuous Abelian sandpile model*
18. D Dailisan, MT Lim. *Free-flow regime and overhead cost of vehicle size in traffic flow*
19. GD Sison, GA Tapang. *Characterization of the Kuramoto Model using Information Theoretic Techniques*

13th National Symposium in Marine Science

20. MRL Algodon, M Soriano. *Sizing up corals: Video Cues Coral Reef Stitched Images*
21. LT David, KSA Cordero-Bailey, M Soriano, PM Aliño, WRY Licuanan, et al. *Remapping the Philippine reefs: the Coral Reef Visualization and Assessment (CoRVA) program*
22. A. Santos, M. Soriano. *3D Mapping of Seabed Using Teardrop and Side Scan Sonar*
23. L. Dagum, M. Soriano. *Automated Change Detection in Coral Reef Quadrats Imaged Across Time*
24. A. Hilomen, M. Soriano. *Adaptation of Troll Fishing Equipment and Methodologies for Use in Towed Underwater Sensor Platforms*

4. NIP Funded Projects (6)

Project Leader	Title	Period
Caesar A. Saloma	Single Gaussian beam interaction with a micrometer size dielectric spheroidal particle: characteristics of the radiation force	Jan-Dec 2015
Maricor N. Soriano	Image processing of historical maps for land use change detection and hazard mapping	Jan-Dec 2015
May T. Lim	Estimating vehicular traffic flow	Jan-Dec 2015
Giovanni A. Tapang	Exposure of the human colon cancer cell line (HCT116) to various light wavelengths	Jan-Dec 2015
Johnrob Y. Bantang	Investigating the role of quarantine and screening efficiency in dengue epidemics	Jan-Dec 2015

5. Other Funded Project (non-NIP) (6)

Project Leader	Title / Awarding agency	Period/ Phase No.	Amount
Giovanni A. Tapang	VISSER::SM Y1 - VISSER - Sensors and Modules / UP-EIDR	Oct 2013 — Sep 2015	₱ 13,280,000.00
Maricor N. Soriano	Coral reef assessment and visualization - advanced tools (CRAVAT) Project 3 - Integration of ARRAS and CRAVAT tools / DOST GIA	May 2014 - May 2016	₱ 7,068,631.00
Caesar A. Saloma	Human Resource Generation and Funding Absorption Capabilities of the Philippine Scientific Enterprise System / UP President Edgardo J. Angara (UPPEJA) Fellowship award	Mar 2015 — Mar 2016	₱ 500,000.00
May T. Lim	Agent-based modeling of vehicular traffic / OVCRD Outright Grant	Nov. 2014 - October 2015	₱ 300,000.00
Johnrob Y. Bantang	Social-ecological resilience on different spatial and temporal scales (emphasis on the coast) / EIDR funded project with Dr. Helen Yap as the Program Leader	Aug 2015 — Aug 2016	₱ 269,440.00
Johnrob Y. Bantang	Spatio-temporal analysis of Internet access data via DILNET / OVCRD SOS	Dec 2015 - Jan 2016	₱ 195,000.00
TOTAL:			**₱ 21,613,071.00**

6. Major equipment upgrade/acquired (3)

Equipment / Description	Cost (PhP)	Mode of acquisition / funding	Project Leader
1 Lot Display Systems (3D capable smart TV and projector)	₱ 78,000.00	CRAVAT Project Equipment Outlay	Maricor Soriano
1 Lot Optical Test Instruments	₱ 415,510.76	CRAVAT Project Equipment Outlay	Maricor Soriano
8 Dive Tanks	₱ 86,326.20	CRAVAT Project Equipment Outlay	Maricor Soriano
TOTAL:	**₱ 579,836.96**		

7. Research travels abroad (2)

Name	Purpose	Place	Dates	Mode of Exchange
Soriano, Maricor	To attend training in research commercialization	London and Oxford	March 23-April 6, 2015	UK Newton Fund
Algodon, Meryl	To deliver paper in the OCEANS 2015 Conference	Washington DC		CRAVAT Project Funds

8. Visiting researchers (0)

Name of visitor	Purpose/duration	Contact person	Mode of Exchange
Dr. Mary Ann Go	July-October 2015	Dr. Maricor Soriano	Consultancy through CRAVAT Project Funds

C. Extension Work Highlights

1. Extension work activities (0)

Description / Duration	Beneficiary	NIP Personnel	Remarks
Plenary speaker April 11, 2015, BIOTA Convention	BIOTA (Biology Teachers' Association)	Maricor Soriano	
DOST-PCIEERD Technical Panel	DOST	Maricor Soriano	

2. Research interns and OJT's trained (6)

Name	Beneficiary	Program / Duration	NIP Personnel	Remarks
Hannah Nicole Alag	Phil. Science High School Central Visayas Campus	Summer Internship Program — Philippine Science High School / May - Jun 2015	Maricor N. Soriano	through NIP MOA
Maxelle Millan	PSHS Central Luzon Campus	Summer Internship Program — Philippine Science High School / May - Jun 2015	Maricor N. Soriano	through NIP MOA
Ralph Vincent Togmoy	PSHS Cordillera Administrative Region Campus	Summer Internship Program — Philippine Science High School / May - Jun 2015	Maricor N. Soriano	through NIP MOA
Klarence Emmanuel Decena	PSHS Ilocos Region Campus	Summer Internship Program — Philippine Science High School / May - Jun 2015	Maricor N. Soriano	through NIP MOA
Donnabhel Ann Mariñas Flores	University of Northern Philippines (UNP)	Summer Practical Training Program — DOST SEI / Mar - Apr 2015	Maricor N. Soriano	through NIP MOA
Dean Alvin Lopen Pablico	University of Northern Philippines (UNP)	Summer Practical Training Program — DOST SEI / Mar - Apr 2015	Maricor N. Soriano	through NIP MOA

D. Main Challenges Encountered and Proposed Solutions

Challenge encountered	Proposed solution
Procurement delays	Have a fast lane for purchase of research and academic equipment and supplies

E. Awards or Accreditations Received / Positions of Responsibility Held and Other Accomplishments

1. National (2)

Name	Accomplishment	Date / Place
Caesar A. Saloma	Appointed as Scientist III by the UP Board of Regents (2015, third time)	Jan - Dec 2015 / University of the Philippines
Caesar A. Saloma	Editor-in-Chief of the Philippines Journal of Science	2012 - present

2. International (0)

Name	Accomplishment	Date / Place
N/A		

3. Other accomplishments (2)

Name	Accomplishment	Date / Place
Caesar A. Saloma	His research has recently been featured in a recent article in The New York Times "How to Survive a Stampede" (www.nytimes.com/2015/11/15/magazine/how-to-survive-a-stampede.html; accessed 17 November 2015)	Nov 2015 / New York Times
Maricor Soriano	UK Newton Fund Leaders in Innovation Fellow	28 March- 1 April 2015, Royal Academy of Engineering, London and Oxford

III. Photos, ISI/SCI Publications

A. Photos

IPL Principal Investigators and PhD Staff members (L to R): Prof. Caesar A. Saloma, Prof. Maricor N. Soriano, Prof. May T. Lim, Prof. Giovanni A. Tapang, Assoc. Prof. Johnrob Y. Bantang, Asst. Prof. Rene C. Batac. [photos: courtesy of Dr. Val Almoro of NIP Administration]

December 2015 / IPL group photo as it ends the Year End celebration during the Christmas season. The theme of the party costume highlights the fashion on the different era in the Philippines. [photo: courtesy of Mr. Albert Yumol]

October 2015 / IPL welcomes new members with a “birthday cake”. There were 23 new members accepted after the August 2015 application period. [photo: Johnrob Y Bantang]

VISSER equipment and tools in use by students. [photo: VISSER]

June 2015 (SPP 2015) / Pictures taken during the SPP Conference attended by IPL members. [photo: courtesy of Mary Angelie Alagao]

October 2015 / Sync-Bio-Optics group held a workshop. [photo: VISSER]

B. ISI/SCI Publications

Listing of front-page copies of ISI/SCI Publications

1. C Saloma, GJ Perez, CA Gavile, JJ Ick-Joson, C Palmes-Saloma. *Prior Individual Training and Self-Organized Queuing during Group Emergency Escape of Mice from Water Pool.* PloS one 10 (2), e0118508

PLOS | ONE

RESEARCH ARTICLE

Prior Individual Training and Self-Organized Queuing during Group Emergency Escape of Mice from Water Pool

Caesar Saloma[1]*, Gay Jane Perez[1¤], Catherine Ann Gavile[2‡], Jacqueline Judith Ick-Joson[2‡], Cynthia Palmes-Saloma[2]

1 National Institute of Physics, College of Science, University of the Philippines, Diliman, Quezon City, Philippines, **2** National Institute of Molecular Biology and Biotechnology, College of Science, University of the Philippines, Diliman, Quezon City, Philippines

¤ Current address: Institute of Environmental Science and Meteorology, College of Science, University of the Philippines, Diliman, Quezon City, Philippines
‡ These authors contributed equally to this work.
* csaloma@nip.upd.edu.ph

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Abstract

We study the impact of prior individual training during group emergency evacuation using mice that escape from an enclosed water pool to a dry platform via any of two possible exits. Experimenting with mice avoids serious ethical and legal issues that arise when dealing with unwitting human participants while minimizing concerns regarding the reliability of results obtained from simulated experiments using 'actors'. First, mice were trained separately and their individual escape times measured over several trials. Mice learned quickly to swim towards an exit–they achieved their fastest escape times within the first four trials. The trained mice were then placed together in the pool and allowed to escape. No two mice were permitted in the pool beforehand and only one could pass through an exit opening at any given time. At first trial, groups of trained mice escaped seven and five times faster than their corresponding control groups of untrained mice at pool occupancy rate ρ of 11.9% and 4%, respectively. Faster evacuation happened because trained mice: (a) had better recognition of the available pool space and took shorter escape routes to an exit, (b) were less likely to form arches that blocked an exit opening, and (c) utilized the two exits efficiently without preference. Trained groups achieved continuous egress without an apparent leader-coordinator (self-organized queuing)—a collective behavior not experienced during individual training. Queuing was unobserved in untrained groups where mice were prone to wall seeking, aimless swimming and/or blind copying that produced circuitous escape routes, biased exit use and clogging. The experiments also reveal that faster and less costly group training at $\rho = 4\%$, yielded an average individual escape time that is comparable with individualized training. However, group training in a more crowded pool ($\rho = 11.9\%$) produced a longer average individual escape time.

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Modified inelastic bouncing ball model for describing the dynamics of granular materials in a vibrated container

Junius André F. Balista [a,b], Caesar Saloma [a,*]

[a] National Institute of Physics, University of the Philippines, Diliman 1011, Quezon City, Philippines
[b] Institute of Mathematical Sciences and Physics, University of the Philippines, Los Baños, College 4031, Laguna, Philippines

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ABSTRACT

We show that at the onset of convection, the acceleration of a confined granular material is not necessarily equal to that of its vibrated container. Convection happens when the material is able to counter the downward gravitational pull and accelerates at a rate that is equal to the gravitational acceleration g. We modify the Inelastic Bouncing Ball Model and incorporate the transmissibility parameter T_r which measures the efficiency that the external force driving the container is transmitted to the material itself. For a specified T_r value, the material is represented by an inelastic bouncing ball with a time-of-flight $T(\Gamma; T_r)$ where $\Gamma = A_0\omega^2/g$, is the dimensionless container acceleration, and A_0 and ω are the driving amplitude and angular frequency, respectively. For a given Γ-range, the $T(\Gamma; T_r)$ curve provides the bifurcation diagram of the perturbed material and a family of bifurcation diagrams is generated for a set of T_r values. We illustrate that T_r is useful in rationalizing experimental results produced by confined granular materials that is subjected to a range of applied force magnitudes. For the same physical set-up, the force transmission efficiency from the container to the grains may not remain constant as the force strength is varied. The efficiency is also affected by the presence or absence of air in the vibrated container.

1. Introduction

An object that is in contact but not attached to a vertically oscillating container, levitates when its dimensionless acceleration $\Gamma = a/g$, becomes equal to unity ($\Gamma = 1$) where $a = A_0\omega^2$, is the container acceleration, g is the gravitational acceleration, and A_0 and ω are the vibration amplitude and angular frequency, respectively. The aforementioned threshold condition however, does not automatically apply to movements of extended objects such as confined granular materials that are undergoing convection [1–4]. Assigning a common acceleration for the confined grains and its container is inaccurate because the external force that is applied to the container is not always identical to the force that is experienced by the grains themselves due to possible transmission delays and modulation effects that are caused by elasticity and other dissipation properties.

Poeschel and Schwager [5] attributed the deviation of Γ from unity to the nonlinearity of the granular interactions. They studied the motion of the individual grains using the response parameter R that depends on the elastic and dissipative properties of the grains. Okudaira [6] on the other hand, treated the granular material in bulk and utilized the transmissibility parameter T_r, that has a simpler functional form than R.

We re-examine the force-transmission issue and address the continuing interest at finding more accurate models for explaining the complex dynamics that is observed in granular materials, especially mixtures [7,8]. We investigate the potential of the Inelastic Bouncing Ball Model (IBBM) that was originally formulated to describe the motion of an inelastic ball on an oscillating plate [9–11]. The IBBM stipulates that the ball levitates once its upward acceleration exceeds g and dissipates its kinetic energy completely upon collision with the plate. Pastor et al. [12] had suggested earlier that the IBBM at least in its original form, is inadequate for describing the dynamics of a vibrated granular material.

We show that at the onset of convection, the acceleration of the confined granular material is not necessarily equal to that of its vibrated container. We extend the applicability of the IBBM to perturbed confined granular systems by modifying the IBBM and incorporating the transmissibility parameter T_r which measures the efficiency that the external force driving the container is transmitted to the material itself.

* Corresponding author. Tel.: +63 29295401.
E-mail addresses: caesar.saloma@gmail.com, csaloma@nip.upd.edu.ph (C. Saloma).

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RESEARCH ARTICLE

Quantifying Regional Differences in the Length of Twitter Messages

Christian M. Alis[1]*, May T. Lim[2], Helen Susannah Moat[3], Daniele Barchiesi[1], Tobias Preis[3], Steven R. Bishop[1]

1 Department of Mathematics, University College London, London, United Kingdom, **2** National Institute of Physics, University of the Philippines Diliman, Quezon City, Philippines, **3** Warwick Business School, University of Warwick, Coventry, United Kingdom

* c.alis@ucl.ac.uk

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Abstract

The increasing usage of social media for conversations, together with the availability of its data to researchers, provides an opportunity to study human conversations on a large scale. *Twitter*, which allows its users to post messages of up to a limit of 140 characters, is one such social media. Previous studies of utterances in books, movies and *Twitter* have shown that most of these utterances, when transcribed, are much shorter than 140 characters. Furthermore, the median length of *Twitter* messages was found to vary across US states. Here, we investigate whether the length of *Twitter* messages varies across different regions in the UK. We find that the median message length, depending on grouping, can differ by up to 2 characters.

Introduction

As more people turn online to communicate or to seek information, the possibility of understanding their offline behaviour by means of their online digital traces becomes more appealing. Previous studies employing these digital traces allowed researchers to test hypotheses on happiness [1], social influence [2, 3] and social organization [4], gain insights on decision making in stock markets [5–7] and elections [8], and quantify social phenomena [9]. Online social media and search engine query data not only allow researchers to detect events happening in the present [10–13], but also enable them to make predictions about the future [14, 15]. The ubiquity of social media has been useful in investigating disasters [16, 17], which may help in saving human lives (see [18] for a review). Indeed, datasets generated from online activities of people are important resources in the field of computational social science [19, 20]. Even the digitisation of large amounts of offline information is also useful as it has enabled researchers to study language [21] and scientific progress [22, 23],

Twitter is a social media platform that allows its users to post messages (*tweets*) of up to 140 characters, which are public by default. It is one of the most popular online social media with 255 million average monthly users as of 31 March 2014 [24]. According to the Ipsos MediaCT Tech Tracker report [25], 18% of adults in the UK visited Twitter in the third quarter of 2014.

4. JCS Pang, JY Bantang. *Hodgkin–Huxley neurons with defective and blocked ion channels.* International Journal of Modern Physics C, 1550112

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Hodgkin–Huxley neurons with defective and blocked ion channels

James Christopher S. Pang* and Johnrob Y. Bantang†
National Institute of Physics, University of the Philippines Diliman
Quezon City 1101, Philippines
**jpang@nip.upd.edu.ph*
†*jybantang@upd.edu.ph*

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We utilize the original Hodgkin–Huxley (HH) model to consider the effects of defective ion channels to the temporal response of neurons. Statistics of firing rate and inter-spike interval (ISI) reveal that production of action potentials (APs) in neurons is not sensitive to changes in membrane conductance for sodium and potassium ions, as well as to the reversal potential for sodium ions, as long as the relevant parameters do not exceed 13% from their normal levels. We also found that blockage of a critical fraction of either sodium or potassium channels (dependent on constant input current) respectively limits the firing activity or increases spontaneous spiking activity of neurons. Our model may be used to guide experiment designs related to ion channel control drug development.

Keywords: Hodgkin–Huxley neurons; ion channels; defect.

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1. Introduction

The human brain is believed to be a large network system consisting of functional modules controlled by microscopic cells called neurons.[1] The vast majority of these cells generate series of brief voltage pulses in response to electrical current input I. These voltage pulses, referred to as *action potentials* (hereon APs, also known as "*spikes*"), exhibit a thresholded response[2]; that is, no AP is produced when I is less than a specific value.

The dynamics of each neuron's AP reflects the intrinsic properties of its membrane, thus could differ from cell to cell. These properties are governed by ion channels that regulate the flow of ions (sodium, Na^+ and potassium, K^+) through the cell membrane. It has been shown that defects on these neuron's vital structures manifest as physiological diseases related to neural injuries.[3] Identifying defective mechanisms affecting neural responses is an important information that could help

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Statistical Properties of the Immediate Aftershocks of the 15 October 2013 Magnitude 7.1 Earthquake in Bohol, Philippines

Rene C. BATAC

National Institute of Physics, University of the Philippines,
Quezon City, Philippines; e-mail: rbatac@nip.upd.edu.ph

A b s t r a c t

The aftershock records of the magnitude 7.1 earthquake that hit the island of Bohol in central Philippines on 15 October 2013 is investigated in the light of previous results for the Philippines using historical earthquakes. Statistics of interevent distances and interevent times between successive aftershocks recorded for the whole month of October 2013 show marked differences from those of historical earthquakes from two Philippine catalogues of varying periods and completeness levels. In particular, the distributions closely follow only the regimes of the historical distributions that were previously attributed to the strong spatio-temporal correlations. The results therefore suggest that these correlated regimes which emerged naturally from the analyses are strongly dominated by the clustering of aftershock events.

Key words: earthquakes, interevent distances, interevent times, time series analysis.

1. INTRODUCTION

The magnitude (M_w) 7.1 earthquake that affected the island of Bohol in central Philippines on 15 October 2013 resulted in the death of 222 people and economic losses amounting to 52.06 US dollars due to the destruction of infrastructure (Lagmay and Eco 2014), including cultural heritage buildings

6. AA Paguirigan, CP Monterola, RC Batac. *Loss of criticality in the avalanche statistics of sandpiles with dissipative sites.* Communications in Nonlinear Science and Numerical Simulation 20 (3), 785-793

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Loss of criticality in the avalanche statistics of sandpiles with dissipative sites

Antonino A. Paguirigan Jr. [a], Christopher P. Monterola [b], Rene C. Batac [a,*]

[a] National Institute of Physics, University of the Philippines Diliman, 1101 Quezon City, Philippines
[b] Complex Systems Group, Computing Science Department, Institute of High Performance Computing, Agency for Science, Technology and Research, Singapore

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ABSTRACT

To account for the dissipative mechanisms found in nature, non-conservative elements have been incorporated in the energy redistribution rules of sandpiles and similar models of hazard phenomena. In this work, we found that incorporating non-conservation in the form of spatially-distributed sink sites affect both the external driving and internal cascade mechanisms of the sandpile. Increasing sink densities result in the loss of critical behavior, as evidenced by the gradual evolution of the avalanche size distribution from power-law (correlated) to exponential (random). For low density cases, we found no optimal configuration that will minimize the risk of producing large avalanches. Our model is inspired by analogs in natural avalanche systems, where non-conservative elements have an inherent spatial distribution.

1. Introduction

The emergence of power-law avalanche size distributions out of simple local interactions in the sandpile model [1] spurred interest in sandpile-inspired mathematical models of natural events believed to be exhibiting self-organized criticality [2–7]. Despite their simplicity, these discrete numerical models have complemented the results from field data [2,3,7] and scaled experiments [6] in advancing our understanding of the possible mechanisms underlying natural hazards. Because the sandpile model is inspired by the avalanche dynamics observed in slowly-driven piles of sand, the insights gained from numerical implementations of these models may be used in designing effective assessment and mitigation strategies for actual landslides and avalanche events.

Needless to say, to be of practical use, several features of the model had to be adjusted to incorporate realistic scenarios. Apart from using continuous "energy" values [8], asymmetric redistribution rules [4,5] that may be time-varying [6], and non-uniform driving magnitudes [7], several models incorporate non-conservative rules for the distribution of energies during individual toppling events [4,5,9]. Non-conservation, which is prevalent in many open systems in the natural setting, is oftentimes introduced as a global parameter $C \in (0, 1]$ describing the fraction of energy transferred to the site's neighbors during local toppling events. For sandpiles with cell states that have continuous values, the introduction of non-conservative rules resulted in stretched exponential distributions, signifying the loss of critical behavior [9]. As applied to landslide modeling, the level of non-conservation explained the origin of key features of the empirical landslide distributions, particularly the power-law exponents and the occurrence of systematic deviations for small landslides [5].

* Corresponding author. Tel.: +63 2 981 8500x3701.
E-mail address: rbatac@nip.upd.edu.ph (R.C. Batac).

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Spatiotemporal recurrences of sandpile avalanches

Anjali B. Tarun, Antonino A. Paguirigan Jr., Rene C. Batac *

National Institute of Physics, University of the Philippines, Diliman, 1101 Quezon City, Philippines

HIGHLIGHTS

- Spatiotemporal recurrences in the sandpile model were investigated.
- We connect avalanches with nearest or farthest later events.
- We observe previously unreported scale-free regimes in space and time.
- Connecting farthest events also resulted in scale-free in-degree distributions.

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ABSTRACT

We study the space and time properties of avalanches in a continuous sandpile model by constructing a temporally directed network linking together the recurrent avalanche events based on their spatial separation. We use two different criteria for network construction: a later event is connected to a previous one if it is either nearest or farthest from it among all the later events. With this, we observe scale-free regimes emerge as characterized by the following power-law exponents: (a) $\alpha = 1.7$ for the avalanche size distributions; (b) $\beta_F = 2.1$ in the in-degree distribution of farthest recurrences; (c) $\delta = 1$ for the separation distances; and (d) $\gamma = 1$ for the temporal separations of recurrences. Our results agree with earlier observations that describe the sandpile avalanches as repulsive events, i.e. the next avalanche is more likely to be physically separated from an earlier one. These observations, which are not captured by usual interoccurrence statistics and by random connection mechanisms, suggest an underlying spatiotemporal organization in the sandpile that makes it useful for modeling real-world systems.

1. Introduction

The sandpile model and its variants, originally intended as representative systems for illustrating self-organized criticality (SOC) [1], have now been utilized for modeling systems in the natural setting believed to be exhibiting SOC characteristics. These sandpile-based approaches use the avalanches in the grid as representative of the event size of the natural system in consideration. In many cases, therefore, the efficacy of a model is primarily gauged by its ability to replicate the power-law and "rollover" regimes in the event size distributions, like the Gutenberg–Richter law of earthquake energies [2–4] and the volume and area distributions of landslides [5–7]. It is important to note, however, that such natural hazards have an inherent spatial and temporal dimension; earthquakes, in particular, show strong spatiotemporal clustering [8], while landslides tend to occur at susceptible regions, as characterized by the slope properties [9]. Another point of interest is in the correlation among these events, which are believed to exhibit strong memory. It is therefore of particular interest to see whether these spatiotemporal properties and event correlations are also captured by sandpile-based approaches.

* Corresponding author.
E-mail address: rbatac@nip.upd.edu.ph (R.C. Batac).

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