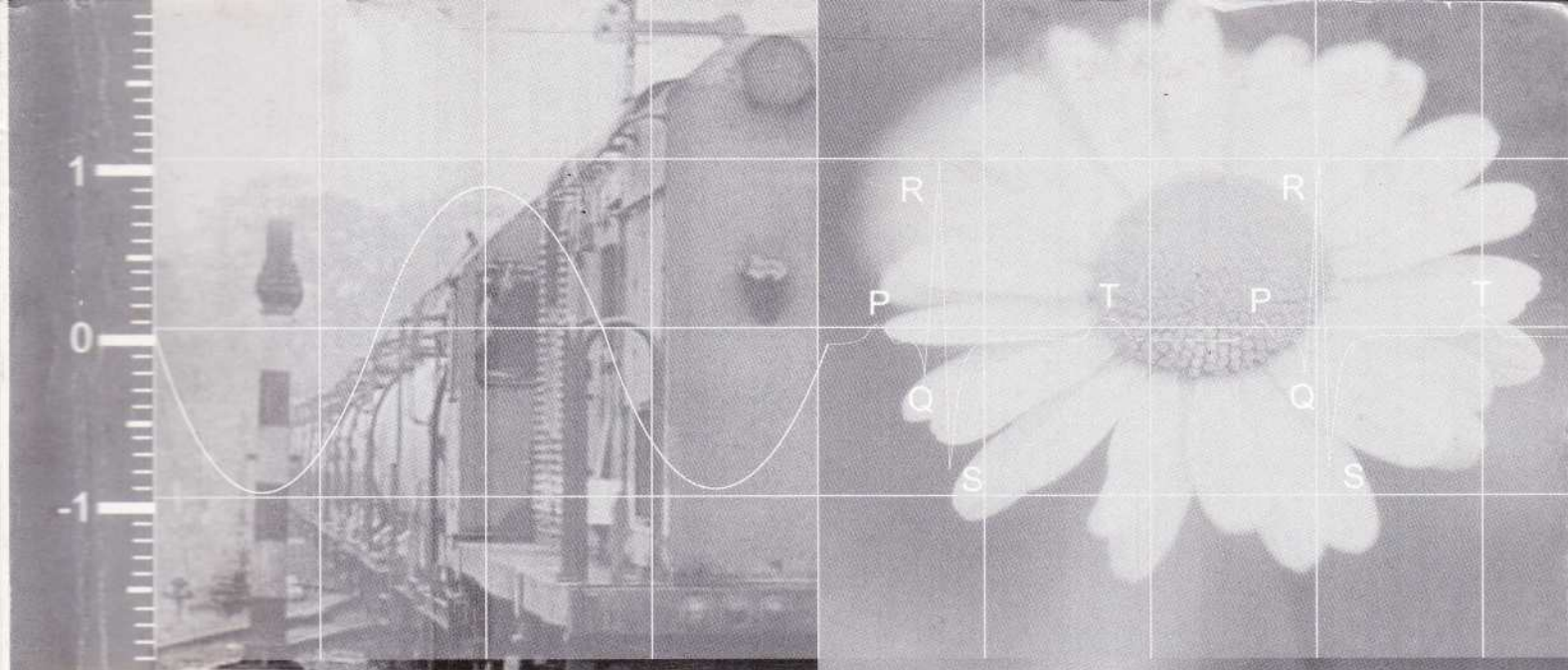




**Proceeding of The International Seminar
on Natural Sciences
and Applied Natural Sciences**

Auditorium Kampus III UAD, February 17, 2007

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Hosted by:

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Universitas Ahmad Dahlan

Yogyakarta

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International Seminar on Natural Sciences and Applied Natural Sciences

**Auditorium Kampus III UAD, Yogyakarta
Saturday, February 17, 2007**

Proceeding

**Hosted by
Fakultas Matematika dan Ilmu Pengetahuan Alam
(Faculty of Mathematics and Natural Sciences)
Universitas Ahmad Dahlan**

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Proceeding of The International Seminar on Natural Sciences and Applied Natural Sciences

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Preface

Assalamu'alikum warohmatullahi wabarokatuh.

Today there is a fact that many qualified researches conducted by researchers from universities have a few opportunities to be communicated in the forum like international seminars and also are rarely published in periodicals or journals though it is realized that they are significantly important not only for the development of science, technology, and industry but also for the teaching-staffs of higher educations themselves to improve their professions. Therefore an effort to provide a medium accommodating that demand needs appreciating.

In relation to the problem Faculty of Mathematics and Natural Sciences Ahmad Dahlan University Yogyakarta vigorously holds an International Seminar on Mathematics, Natural Sciences, and their Applications which is divided into two sessions-panel discussion, and parallel sessions comprising papers on biology, physics, mathematics, computer science, education mathematics and natural sciences, and their applications. It is hoped that this program can serve as a medium for sharing information and publishing the results of researches on that field either conducted by higher educations, research institutes, industries or observers. To fulfil that hope the committee tries to publish the proceeding of the seminar so that the results can become new beneficial references and be widely read by various circles of people for further studies and applications.

In addition, we also wish this program could become an important moment of meeting between higher educations and industries so that they could make some win-win cooperations especially directed to the sustainable civil-society development.

Finally, we realize that the success of the seminar depends very much on all people involving in it, accordingly we express our deep gratitude and high appreciation to those who have participated in the program.

Wassalamu'alaikum warohmatullahi wabarokatuh.

Dr. Hj. M. Dwi Suhartanti, M.Si.
Chief of The Organizing Committee

SPEECH OF THE DEAN MATHEMATICS AND NATURAL SCIENCES FACULTY

Assalmu'alaikum Wr Wb

Bismillahirrohmanirohim

In the name of Allah, Most gracious Most merciful. I would like to say thanks to Allah that blesses us in the meeting on International Seminar of Natural Sciences and Applied Natural Sciences.

Allah is Most gracious has given us every things on the earth as well as in the sky for human living demands in the world, to gain successfully life in the beyond of hereafter. Human Living demands are different from one generation to next generation. We aware that human demands more complex in the future, there fore it needs higher technology that is more sophisticated. We are sure, it very depends on improving Mathematics and Natural sciences as its foundations.

Based on those reasons, this forum would be very important because this forum will give experiment results and the latest issues of Mathematics and Natural sciences improvement. Furthermore Mathematics and natural sciences education will be communicated. The communications between researchers to share experience will make improving in the next experiments and expand our knowledge. It will raise new ideas for other researchers to conduct the new experiments. Therefore the beneficial of all things were created by Allah for human demands would be more useful.

As a care taker, I would like to say “ Well come to Faculty of Mathematics and Natural Sciences , Ahmad Dahlan University, thank you very much for all your attention and participation” I hope this seminar will be successful, Good luck for all of us.
Wassalamu'alaikum Wr Wb

Yogyakarta, February 17, 2007

Dean of Mathematics and Natural Sciences

Drs. Aris Thobirin, M.Si

**SPEECH OF THE RECTOR
AHMAD DAHLAN UNIVERSITY**

First of all, I would like to express my gratitude to all participants of this seminar in having a lot of spirit to make success of the seminar. Secondly, I would like to appreciate all the speakers, both from Indonesia and from abroad. Special thanks I would like to address to Prof. Mustafa Matdris and Prof. Ismail bin Mohammad from Malaysia and Prof Sukarti who will be presenting many important issues in the keynote speeches of the seminar.

Natural science is the science that is basically needed by everyone. It is very close to all phenomena about life and all activities of human being. Moreover, everyone who would be mastery in advance technology needs natural science. How aircraft could fly, boats and ships could float, power engine could pull thousand tons of wagons, green leaves could make sugar from water and carbon dioxide could only be explained if we understand natural science. Even I would like to address attention of all participants on the some natural disaster happened in Indonesia in the last couple years. Both the reason and how to overcome the demolishing effect of tsunami in Aceh, earthquake in Yogyakarta and Central Java, flood in Jakarta are also only could be explained if we understand the natural science.

In the other hand, a lot of people do not realize that they need the natural science. Special case in Indonesia, many study programs offering the natural sciences do not significantly attract new students to join. Even in secondary schools, physics, biology and mathematics, three fields representing the natural sciences are the most unfavorable subject among the pupils. Therefore, this seminar in the natural science takes the significance in opening new horizon saying that we need the natural science because of its role in so many disciplines of scientific world.

At last, I hope that the seminar would benefit to all the participants.

Yogyakarta, February 17, 2007

Rector of Ahmad Dahlan University,

Prof. Dr. Sugiyanto, Pharmacist

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A Sequence of Henstock Equi ν -integrable in A Nondiscrete Locally Compact Metric Space

Manuharawati

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Abstract

Let X be a nondiscrete locally compact metric space, $\mathcal{E}(X)$ be a collection of elementary sets in X , ν be a continuous volume function on $\mathcal{E}(X)$. In this paper, we will discuss that if (g_n) is Henstock equi ν -integrable on a cell E in X and (g_n) is uniformly convergent to a function g on a cell E , then (g_n) has functionally small Riemann sum property with respect to ν uniformly in n on a cell E .

Key words:

nondiscrete locally compact metric space, elementary set, cell.

1. Introduction

In 1995, Soeparna discussed some small Riemann sum properties in R . In 2002, Manuharawati generalized some small Riemann sum properties in a nondiscrete locally compact metric space (X, d) . The main goal of this paper is to prove that a sequence has functionally small Riemann sum (FSRS) property with respect to ν uniformly in n on a cell E if the sequence of functions (g_n) is Henstock equi ν -integrable on a cell E and (g_n) is uniformly convergent to a function g on a cell E .

2. Basic Concept

Given a system of intervals $\mathcal{J}$ in nondiscrete locally compact metric space

(X, d) . A collection of all elementary sets in X is denoted by $\mathcal{E}(X)$. If E is a compact elementary set with $\text{int}(E) \neq \emptyset$ and $\delta: E \rightarrow R^+$ is a function, then a finite collection of cell-point pairs

$$P = \{(A_{x_i}, x_i), 1 \leq i \leq n\} = \{(A_i, x_i)\}$$

is called a **Perron δ -fine partition on E** if $x_i \in A_{x_i} \subset N(x_i, \delta(x_i))$ and $\{A_{x_i}\}$ is a partition on E .

Let ν be a continuous volume function on $\mathcal{E}(X)$, and $\mu^*: 2^X \rightarrow R^+$ be outer measure on X generated by ν .

A function $g: X \rightarrow R^+$ is said to be **Henstock ν -integrable** on a cell $E \subset X$, denoted by $g \in H(E, \nu)$ if there exists a real number α with property: for any real number $\varepsilon > 0$ there

exists a function $\delta: E \rightarrow \mathbb{R}^+$ such that for each Perron δ -fine partition $P =$

$\{A_{x_1}, A_{x_2}, \dots, A_{x_n}; x_1, x_2, \dots, x_n\} = \{(A_x, x)\}$ of E we have

$$\left| \sum_{i=1}^n g(x_i) \nu(A_{x_i}) - \alpha \right| = |\mathbb{P} \sum g(x) \nu(A_x) - \alpha| < \varepsilon$$

3. Functionally Small Riemann Sum

Given a cell $E \in \mathcal{S}$, and a function $g: X \rightarrow \mathbb{R}^*$. A function g is said to have **functionally small Riemann sum property with respect to ν on E** , denoted by $g \in \text{FSRS}(E, \nu)$, if g is μ^* -measurable on E and for any real number $\varepsilon > 0$ there exist a nonnegative μ -integrable function f on E and a function $\delta: E \rightarrow \mathbb{R}^+$ such that for any Perron δ -fine partition $P = \{(A_x, x)\}$ on E we have

$$\left| \mathbb{P} \sum_{|g(x)| > f(x)} g_n(x) \nu(A_x) \right| < \varepsilon.$$

Given a function $g_n: X \rightarrow \mathbb{R}^*$. A sequence of functions $\{g_n\}$ is said to have **FSRS property with respect to ν uniformly in n on E** (uniformly ν -FSRS in n on E) a cell $E \subset X$ if for each n , the function g_n is μ^* -measurable on E and for any real number $\varepsilon > 0$ there exist a nonnegative μ -integrable function f on E and a function $\delta: E \rightarrow \mathbb{R}^+$, which is independent on n , such that for any Perron δ -fine partition $P = \{(A_x, x)\}$ of E and for each n we have

$$\left| \mathbb{P} \sum_{|g_n(x)| > f(x)} g_n(x) \nu(A_x) \right| < \varepsilon.$$

A sequence of functions $\{g_n\}$ is said to be **Henstock equi integrable with respect to ν** (Henstock equi ν -integrable) on a cell $E \subset X$ if for any real number $\varepsilon > 0$ there exists a function $\delta: E \rightarrow \mathbb{R}^+$, which is independent of n such that for any Perron δ -fine partition $P = \{(A_x, x)\}$ of E and for each n we have

$$\left| (H) \int_E g_n d\nu - \mathbb{P} \sum g_n(x) \nu(A_x) \right| < \varepsilon.$$

Some main properties of Functionally Small Riemann properties are discussed as follows.

Theorem 3.1 (Manuharawati, 2002: 141): *Given a cell $E \subset X$ and functions $g, g_n: X \rightarrow \mathbb{R}^*$. If a sequence of functions (g_n) has FSRS property with respect to ν uniformly in n on a cell E and converges to a function g almost everywhere on E , then $g \in \text{FSRS}(E, \nu)$.*

Lemma 3.2 (Manuharawati, 2006): *Given a cell $E \subset X$ and functions $g, g_n: X \rightarrow \mathbb{R}^*$. If a sequence of functions (g_n) is Henstock equi ν -integrable on a cell E and converges to a function g almost everywhere on E , then $g \in H(E, \nu)$.*

Theorem 3.3 : *Given a cell $E \subset X$ and functions $g, g_n: X \rightarrow \mathbb{R}^*$. If a sequence of functions (g_n) is Henstock equi ν -integrable on a cell E and (g_n) is uniformly convergent to a function g on a cell E , then (g_n) has FSRS property with respect to ν uniformly in n on a cell E .*

Proof: Since the sequence of functions (g_n) has FSRS property with respect to ν uniformly in n on a cell E and converges to a function g almost everywhere on E , then by Theorem 3.1, $g \in \text{FSRS}(E, \nu)$. So by Lemma 3.2, $g \in H(E, \nu)$. Let a real number $\epsilon > 0$ be given. Since $g \in \text{FSRS}(E, \nu)$, then there are a nonnegative function $f \in L(E, \mu)$ and a function $\delta_0: E \rightarrow \mathbb{R}^+$ such that for every Perron δ_0 -fine partition $P_0 = \{(A_x, x)\}$ on E we have

$$\left| P_0 \sum_{|g(x)| > f(x)} g(x) \nu(A_x) \right| < \frac{\epsilon}{2}$$

Since the sequence of functions (g_n) is Henstock equi ν -integrable on a cell E , then for every n , $g_n \in H(E, \nu)$. By Theorem 3.2, $g \in \text{FSRS}(E, \nu)$; so for every real number $\epsilon > 0$, there are a non negative $f \in L(E, \mu)$ and a function $\delta_0: E \rightarrow \mathbb{R}^+$ such that for Perron δ_0 -fine partition $P_n = \{(A_x, x)\}$ on E we have

$$\left| P_n \sum_{|g_n(x)| > f_n(x)} g_n(x) \nu(A_x) \right| < \frac{\epsilon}{2}$$

Since (g_n) is uniformly convergent on E , then for every real number $\epsilon > 0$, there is a natural number N such that for every $n \geq N$ and for every $x \in E$ we have

$$|g_n(x) - g(x)| < \frac{\varepsilon}{2(v(E)+1)}$$

Define the function $\delta: E \rightarrow \mathbb{R}^+$ with

$$\delta(x) = \min \{ \delta_0(x), \delta_i(x) : 1 \leq i \leq N-1 \}.$$

Choose a function $h: E \rightarrow \mathbb{R}^+$ with

$$h(x) = \max \{ f(x), f_n(x) : 1 \leq i \leq N-1 \}.$$

So we have h is nonnegative and $h \in L(E, \mu)$. If $P_0 = \{(A_i, x)\}$ is a Perron δ_0 -fine partition on E , then for every natural number n we have:

(i) For $n \leq N-1$,

$$\left| P \sum_{|g_n(x)| > h(x)} g_n(x) v(A_x) \right| \leq \left| P \sum_{|g(x)| > f_n(x)} g_n(x) v(A_x) \right| < \frac{\varepsilon}{2} < \varepsilon.$$

(ii) For $n \leq N$,

$$\left| P \sum_{|g_n(x)| > h(x)} g_n(x) v(A_x) \right| \leq \left| P \sum_{|g_n(x)| > h(x)} [g_n(x) - g(x)] v(A_x) \right| + \left| P \sum_{|g_n(x)| > h(x)} g(x) v(A_x) \right| <$$

$$\frac{\varepsilon}{2(v(E)+1)} v(E) + \frac{\varepsilon}{2} < \varepsilon$$

It means that (g_n) has FSRS property with respect to v uniformly in n on a cell E .

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